ELECTRICAL WEST

January 1949
25 cents

Selling is an Industry Job, Page 53
Appliances, Page 80

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S.

Here is something really new — a five-lamp "package deal" being featured in stores in Edison territory. And giving it selling impact is a complete Edison promotion, prepared in cooperation with dealers and the manufacturer. In newspapers and magazines, on the air and through the mail, we urge Edison customers to buy.

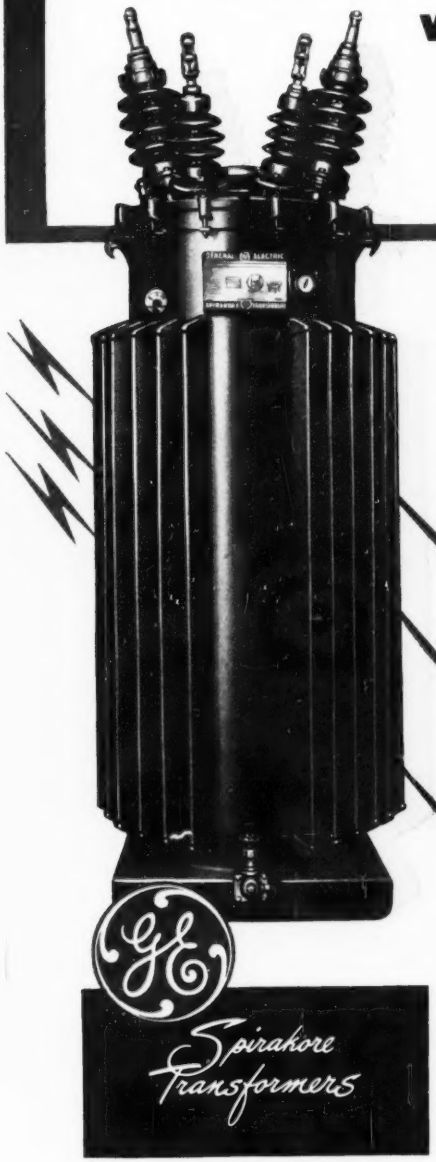
Yes, there's a reason. An Edison survey shows that many homes built in recent years have installed lighting which is inadequate — a condition which new and better lamps will do much to correct.

That's why we call it a "prize package." Customers get a prize — good light to guard their eyesight. Dealers get a prize, too — a five-in-one sale, with a five-in-one profit, every time!

Southern California Edison Company

To foil lightning

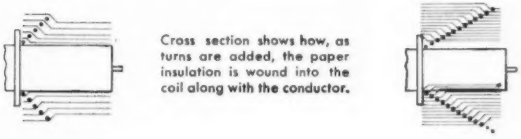
We varied the strength to suit the stress!



To give you distribution transformers with greatly increased impulse strength, we took our cue from the approved textbook principle: "Provide the greatest strength where the stress is greatest." From this principle, we developed our unique design of progressive-layer insulation and shielded winding.

This design compensates for the difference in layer-to-layer voltage stress, from one end to the other, by winding into the coil along with the conductor, a full-layer width of paper dielectric. As turns are added, the paper layers increase in number—keeping the insulation strength, between any two conductors in different layers, proportional to the voltage stress. Furthermore, the entire coil is shielded—giving added protection against the damaging effects of impulse surges. Progressive-layer insulation and shielded windings are a feature of all G-E Spirakore® distribution transformers above 15,000 volts.

Spirakore design—with flux following the spirally wound core steel—affords great savings in total weight. Complete sealing of the tank, with Nitrile rubber gaskets, maintains the high dielectric strength of the oil and prolongs the life of the insulation. Truly one of the finest distribution transformers we've ever made. Ask for Bulletin GEA-4521. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*



Cross section shows how, as turns are added, the paper insulation is wound into the coil along with the conductor.

GENERAL ELECTRIC

405-89

JANUARY 1949

SPOKESMAN FOR MOST HIGHLY ELECTRIFIED REGION OF THE U. S.
The all-industry magazine of progress, established 1887, and incorporating the "Electrical Journal", "Journal of Electricity, Power and Gas" and "Journal of Electricity". Contents Copyright. Sixty-first year of publication.

ELECTRICAL WEST

James H. McGraw (1860-1948), Founder
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W. A. Cyr, Associate Editor — Walter C. Heston, Engineering Editor
Peggy Boyer, Assistant Editor — R. A. Balzari, Publishing Counselor
John W. Otterson, Manager — John Cootz, Typography

FIGURES FORE AND AFT

To a lot of us figures are more fascinating in female form than mathematical. But it is supposed to be better for business to pay more heed to the latter than the former, at least once a year at inventory time. Dedicated as we are to making this a better business for you to be in, no matter what part you play in the industry, once a year we gather from the industry itself all the facts and figures (mathematical) we can in the February Annual Review and Statistical issue. In that issue the progress of the past year (which 1948 will have become by then) is reviewed in generating capacity increase, transmission and distribution growth —as well as in sales, appliances, kwh. per customer and other indices of business. Also at that time the plans and prognostications for the new year are enumerated. While these data may seem to be in too large lumps to relate to one's individual business or job, there is guidance to be had from them by anyone who gives them a little thought. The editors also endeavor to interpret these figures and facts in terms of trends which affect the future of all in the electrical industry. And, of course, the next issue will have concise news of events and people in this dynamic electrical industry.

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Cover photo: Measuring and weighing snow in the Coeur d'Alenes during 1948 snow survey. Washington Water Power photo by John Keith.

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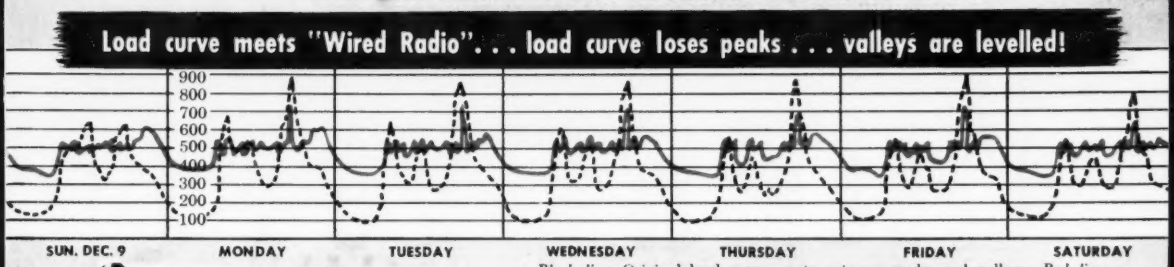
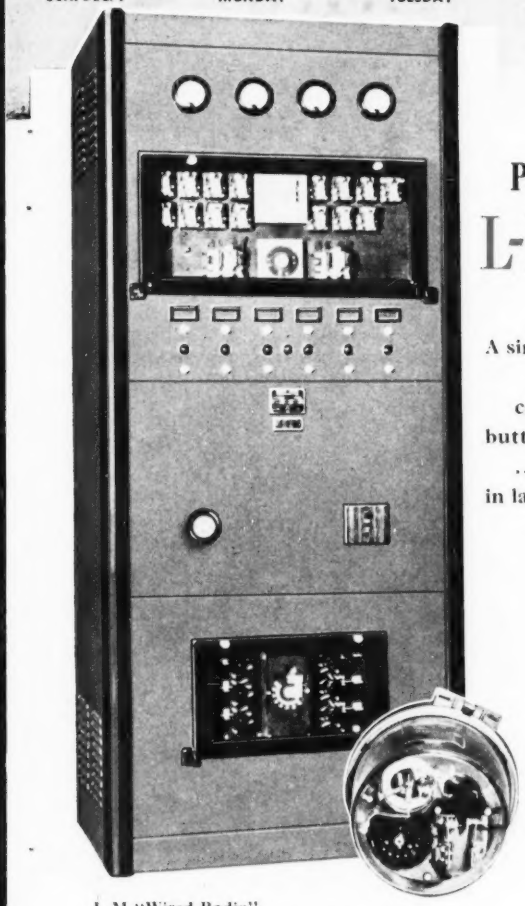


Black line: Original load curve—note extreme peaks and valleys. *Red line:* Load curve after four groups of water heaters were put under L-M "Wired Radio" control. Costly peaks were cut 200 kw, valleys were levelled, leaving 200 kw of peak capacity for future growth.



L-M "Wired Radio" transmitter, and control unit (receiver)
Just push any one of the twelve buttons . . . the transmitter automatically sends out the signal. No pilot wires, no complicated operation.

Control unit operates the individual heater, group of lights, or other load. No tubes, no clocks—only a simple filter circuit. Quickly adjusted to operate on any one of the six signal groups, regardless of location.

Put your loads where you want them...with

L-M "Wired Radio" Control

A simple, flexible method for remote control of water heaters, street lights, and other loads...with low voltage 3000-cycle carrier current sent over your present lines. Simple push-button operation...easily installed...practically no maintenance ...pays for itself in 3 to 5 years. Many 8-10 year installations in large and small cities. Better than 99.9% correct operation.

Push a button—and the automatic transmitter at substation sends out a low voltage 3000 cycle carrier current signal coded for any one of 6 groups of loads. This signal goes wherever the 60-cycle current goes, without interference; but it operates only the group you selected.

You can turn any group of water heaters on or off at any time, spreading the load over profitable off-peak periods. That eliminates peaks caused by clock control. You control street lights manually or by photo-cell, in any desired group. You can thus take full advantage of the many economies of multiple street lighting.

No pilot wires, no clocks, no tubes, no trouble; just a practical, proved control system that works!

Releases distribution and generating capacity by cutting peaks before they occur. Get the lowdown! **Ask the L-M Field Engineer, or write Line Material Co., "Wired Radio" division, East Stroudsburg, Penna.**

LINE MATERIAL "Wired Radio"

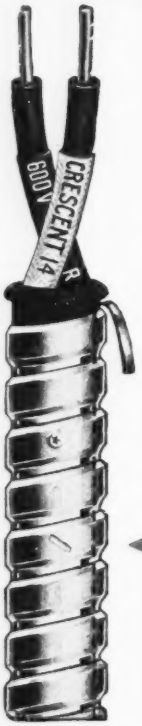
L-M DISTRIBUTION EQUIPMENT INCLUDES: Distribution Transformers • Fuse Cutouts and Fuse Links • Lightning Arresters • Oil Switches • Pole Line Hardware • Line Construction Specialties • Underground Equipment • Fibre Conduit • Street and Airport Lighting Equipment • "Wired Radio" Control Equipment • Capacitors

CRESCENT

A B C ARMORED CABLE

Has These Improved Features Which Make Installation

EASIER—QUICKER—SAFER



Bond Strip Under Armor

Permanently low armor resistance **is provided in sizes No. 14 and 12 AWG by use of a flattened, bonding wire which is in contact with the under side of each convolution.**

Prefabricated Break Lines

The Cut Mark (at 1½" intervals) shows the location of a prefabricated breaking line inside the armor. Only a few strokes of a file or saw guided by the Cut Mark are required to cut through one outer ridge, and a bend by hand severs the armor. This results in a clean separation with no sharp edge—a safer, easier and faster job. The prefabricated breaking lines are so designed that there is *no reduction* in tensile strength, bending quality, crushing resistance and electrical conductivity of armor.

FILE OR SAW

BREAK

PULL OUT PAPER

INSERT BUSHING

In the last 20 years alone, over SIX BILLION FEET of Armored Cable have been produced by the industry. Armored Cable provides the only general purpose, factory-assembled and tested, metal protected wiring system.

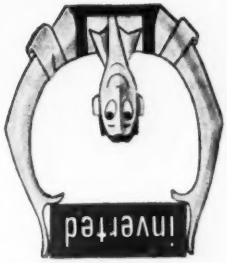
CRESCENT WIRE & CABLE

CRESCENT INSULATED WIRE & CABLE CO.

TRENTON, N. J.

INSTRUMENT TRANSFORMERS

5-KV for Outdoor Service



Mount in any position to suit your convenience

CONVENIENT MOUNTING

These transformers are designed for convenience of mounting in any position—vertical, horizontal or inverted. This is made possible by the sealed construction, and made easy by the versatile mounting bracket.

The sealed construction also eliminates the breathing action which could bring in harmful moisture as the transformer changes temperature. A sheet steel case with all joints welded, plus synthetic rubber gaskets under the primary terminal bushings and the secondary terminal block, assures its remaining weather-proof in any position.

How mounting in different positions is simplified—

A. The bracket is easily detached and can be changed in 90-degree steps.

B. Three one-inch conduit outlets on the secondary terminal compartment make connections easy from any direction.

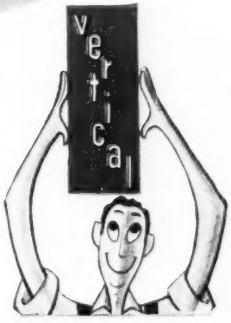
★Type JKA-3 Current

★Type JEA-3 Potential

APPLICATION

These transformers are designed for outdoor service and are suitable for operating meters, relays, and control devices. The potential transformer, Type JEA-3 is available in ratings 2400:120 volts and 4800:120 volts, 60 cycles. The current transformer, Type JKA-3 is available in all preferred primary current ratings, 10:5 amperes to 800:5 amperes inclusive. Both types have insulation for a 60-KV, full wave impulse level.

Your nearest G.E. representative will be glad to discuss specific applications. See him today, or write for Bulletin GEC-409 (JKA-3), and/or GEC-448 (JEA-3). Apparatus Dept., General Electric Company, Schenectady 5, N. Y.



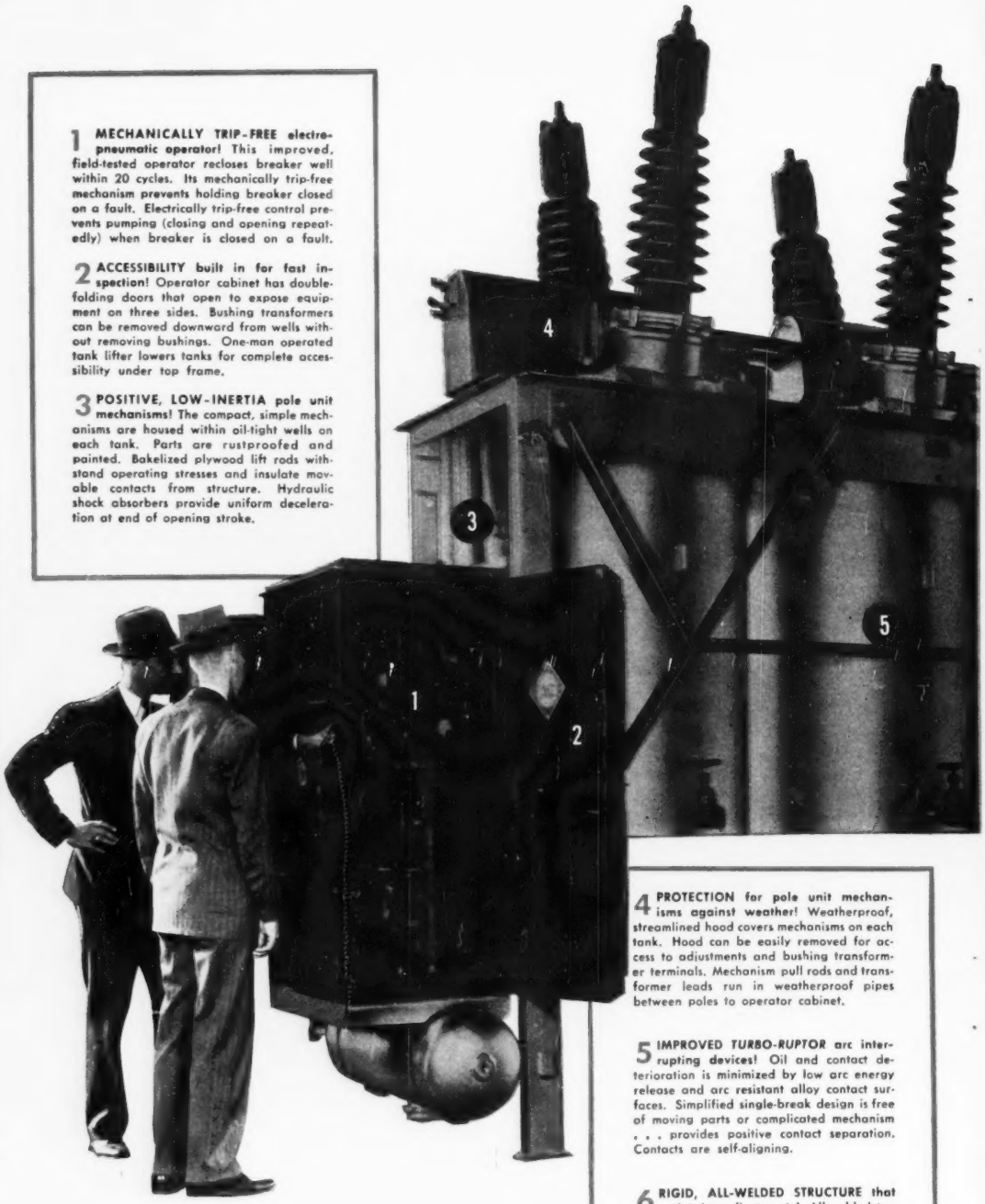
GENERAL ELECTRIC

604-21

1 MECHANICALLY TRIP-FREE electro-pneumatic operator! This improved, field-tested operator recloses breaker well within 20 cycles. Its mechanically trip-free mechanism prevents holding breaker closed on a fault. Electrically trip-free control prevents pumping (closing and opening repeatedly) when breaker is closed on a fault.

2 ACCESSIBILITY built in for fast inspection! Operator cabinet has double-folding doors that open to expose equipment on three sides. Bushing transformers can be removed downward from wells without removing bushings. One-man operated tank lifter lowers tanks for complete accessibility under top frame.

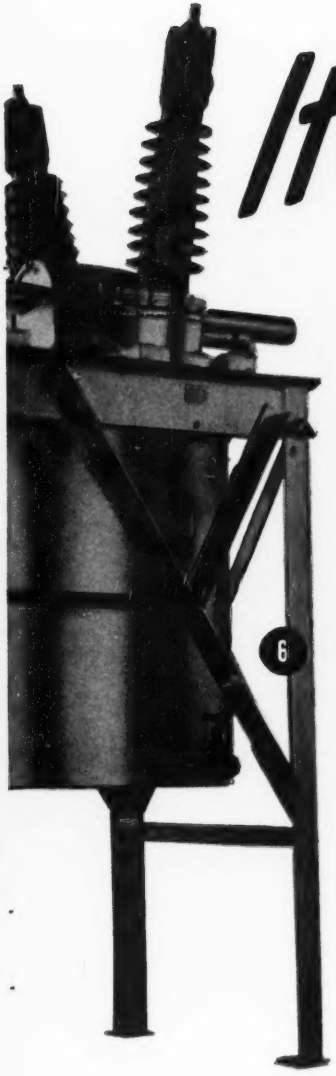
3 POSITIVE, LOW-INERTIA pole unit mechanisms! The compact, simple mechanisms are housed within oil-tight wells on each tank. Parts are rustproofed and painted. Bakelized plywood lift rods withstand operating stresses and insulate movable contacts from structure. Hydraulic shock absorbers provide uniform deceleration at end of opening stroke.



4 PROTECTION for pole unit mechanisms against weather! Weatherproof, streamlined hood covers mechanisms on each tank. Hood can be easily removed for access to adjustments and bushing transformer terminals. Mechanism pull rods and transformer leads run in weatherproof pipes between poles to operator cabinet.

5 IMPROVED *TURBO-RUPTOR* arc interrupting devices! Oil and contact deterioration is minimized by low arc energy release and arc resistant alloy contact surfaces. Simplified single-break design is free of moving parts or complicated mechanism . . . provides positive contact separation. Contacts are self-aligning.

6 RIGID, ALL-WELDED STRUCTURE that maintains adjustments! All-welded top frame supporting entire pole unit is welded to structural frame to form a rigid assembly. Exterior design eliminates corrosion-inviting crevices. Entire breaker is protected by three coats of weatherproof paint.



It's Completely Up-to-Date!

THE NEW ALLIS-CHALMERS FZO-151 OIL CIRCUIT BREAKER

RATED 69 KV: UP TO 3,500,000 KVA — WITH INTERRUPTION IN 8 OR 5 CYCLES . . . FAST RECLOSING WITHIN 20 CYCLES!

LOOK AT SIX of its many important features at left! *All* help you get modern breaker performance—help you save time and money on maintenance.

They include the *mechanically trip-free* electro-pneumatic operator . . . low-inertia pole unit mechanisms . . . and *Turbo-Ruptor* arc interrupting devices. Each is built for long, dependable service.

Talk to your nearby Allis-Chalmers representative about the FZO-151 circuit breaker . . . other Allis-Chalmers 69 kv breakers with 8- or 5-cycle interruption . . . and your other breaker needs, indoor or outdoor, in standard ASA ratings. Or write direct.

Turbo-Ruptor is an Allis-Chalmers trademark.

ALLIS-CHALMERS, 939A SO. 70 ST.
MILWAUKEE, WIS.

ALLIS-CHALMERS

Pioneers in Power and Electrical Equipment from Generation through Utilization

A 2561

BTC

HI-LINE HARDWARE
Used on Important
TRANSMISSION LINES

The Philadelphia Electric Company faced a special transmission line design problem in building the Norristown Branch - Reading Overbuild line connecting Plymouth Meeting and Westmoreland Substations. The populated area to be traversed called for construction of unusual overbuild towers on the Norristown Branch of the Reading Railroad right-of-way. BTC Forged Steel Hardware and Suspension Insulator Caps were used for this important transmission line. Interesting data on this line are as follows:

Length — 9.98 miles between Substations; Reading Overbuild section, 4.43 miles.

Voltage — 66 kv.

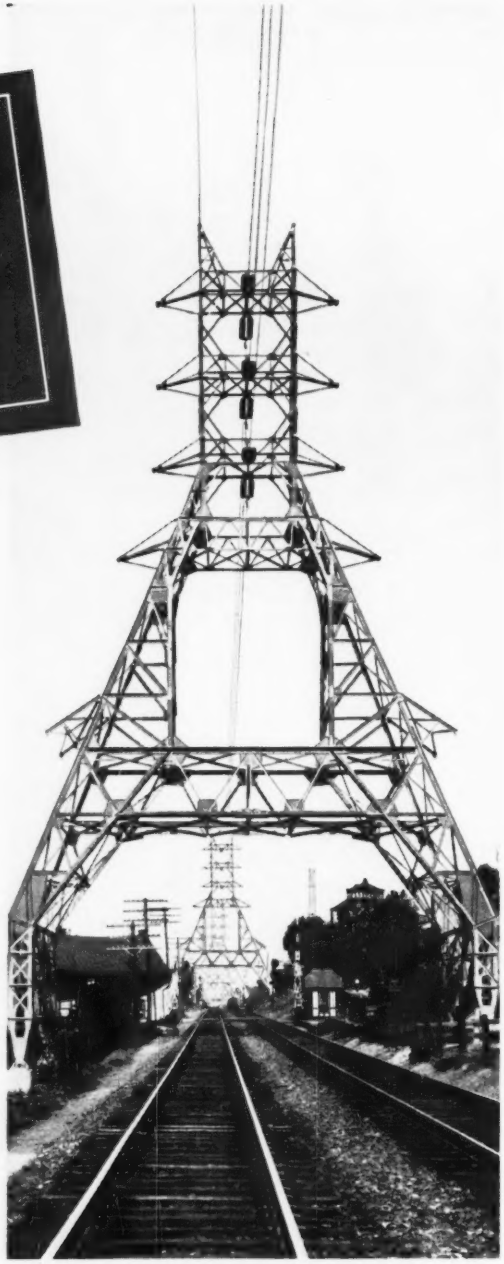
Conductor — 500,000 cm. bare stranded hard drawn copper (37 strands).

Groundwire — Composite cable, Anaconda Design No. 441, with 7-strand Calsun Bronze in core and first layer, and 12 strands Hitenso "BB" in second layer.

Constructed — 1929 and 1930

Contractor — United Engineers & Constructors, Inc.

Sold only through your insulator manufacturer.



View of the Philadelphia Electric Company's Norristown Branch-Reading Overbuild Transmission Line.

THE BREWER - TITCHENER CORPORATION
CORTLAND, N. Y.

LOOK HERE

ANOTHER CM-22 NETWORK PROTECTOR DEVELOPMENT

...to meet today's requirements for higher interrupting capacity

YOU CAN BE SURE..
IF IT'S Westinghouse

Protect your heavily loaded systems with the new Westinghouse CM-22 network protector. New splitter-type arc chambers and improved contacts provide these increases in interrupting ratings.

HERE'S WHAT YOU GAIN

Protector Continuous Rating in Amperes	Old Interrupting Rating in Amperes	New Interrupting Rating in Amperes
800	25,000	30,000
1,200	25,000	30,000
1,600	25,000	30,000
2,000	30,000	35,000
2,500	40,000	60,000
3,000	40,000	60,000

Another New Feature . . .

The new, quick-opening door on subway CM-22 units up to 1,600 amperes, inclusive, minimizes maintenance costs. 92% less time required "getting at the works". J-60688

Westinghouse
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

PIONEER IN NETWORK PROTECTORS FOR 26 YEARS

Announcing

20 watts!

Service-tested!

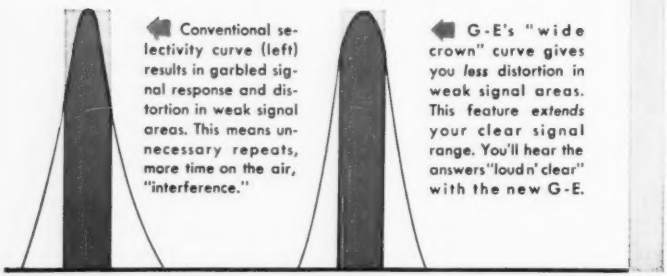
Performance-engineered!

Packed with power!

152-162 MC

THERE'S A *BIG* DIFFERENCE!

HERE'S WHY—



Conventional selectivity curve (left) results in garbled signal response and distortion in weak signal areas. This means unnecessary repeats, more time on the air, "interference."

G-E's "wide crown" curve gives you *less* distortion in weak signal areas. This feature *extends* your clear signal range. You'll hear the answers "loud'n' clear" with the new G-E.

Performance-Engineered at Electronics Park!

- More power at lower cost!
- Rock-steady circuits—minimum drift!
- Operates for long periods without attention! Quick-shift plug-in design reduces out-of-service time.
- Basic Mobile and Station units interchangeable!

a NEW 2-way-radio by GENERAL ELECTRIC

● 20 GROUND-GAINING WATTS IN A SINGLE PACKAGE! ● GIVES YOU *FULL* USE OF YOUR CHANNEL—WITHOUT WEAK SIGNAL DISTORTION! ● IMMEDIATE DELIVERY FROM STOCK!

Now in full production at Electronics Park—General Electric's new MC-201 mobile units combine all the important improvements you've been waiting for!

Subjected to grueling field tests before a single one was manufactured for sale, the new G-E is a tough, powerful piece of equipment built specifically for *your* radio communication needs. It delivers outstanding service at low cost.

Get the facts today! This new bulletin on the MC-201 is yours for the asking. (We will also send you, on request, complete information on G-E's full line of radio communication equipment: 25-50 MC and 920-960 MC). Call the G-E office nearest you or write: *General Electric Company, Box 1122, Electronics Park, Syracuse, New York.*

READ WHAT THEY SAY ABOUT THE PRE-PRODUCTION TESTS!

"We installed new MC-201 mobile units in our cars. We tested them rigorously for a year in every kind of weather and gave them more than normal abuse. The sets continue to give sharp, clear transmission and reception. We're ordering more of them from G.E."*

"We have installed the new G-E MC-201 units in our fleet and have operated with them for the past six months. Their performance has been excellent and maintenance costs exceptionally low. As a result, we plan to expand our system immediately with additional G-E units."*

*Names on request.

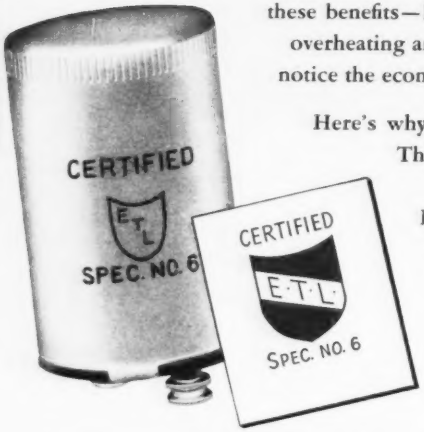
You can put your confidence in—

GENERAL ELECTRIC

You're off to a good start

WITH Certified Starters

Certified Starters play an important role in fluorescent lighting. When your fixtures are equipped with Certified Starters, you are assured of these benefits—longer starter life, less ballast overheating and longer lamp life. You quickly notice the economy in maintenance costs.



Here's why Certified Starters are better: They're made to rigid specifications set up by foremost lighting experts—then tested and checked by famous Electrical Testing Laboratories, Inc.

You'll assure satisfaction, give customers a good start, when you specify Certified Starters—the ones bearing the famous shield "Certified ETL".

All Fleur-O-Lier fixtures use Certified Starters

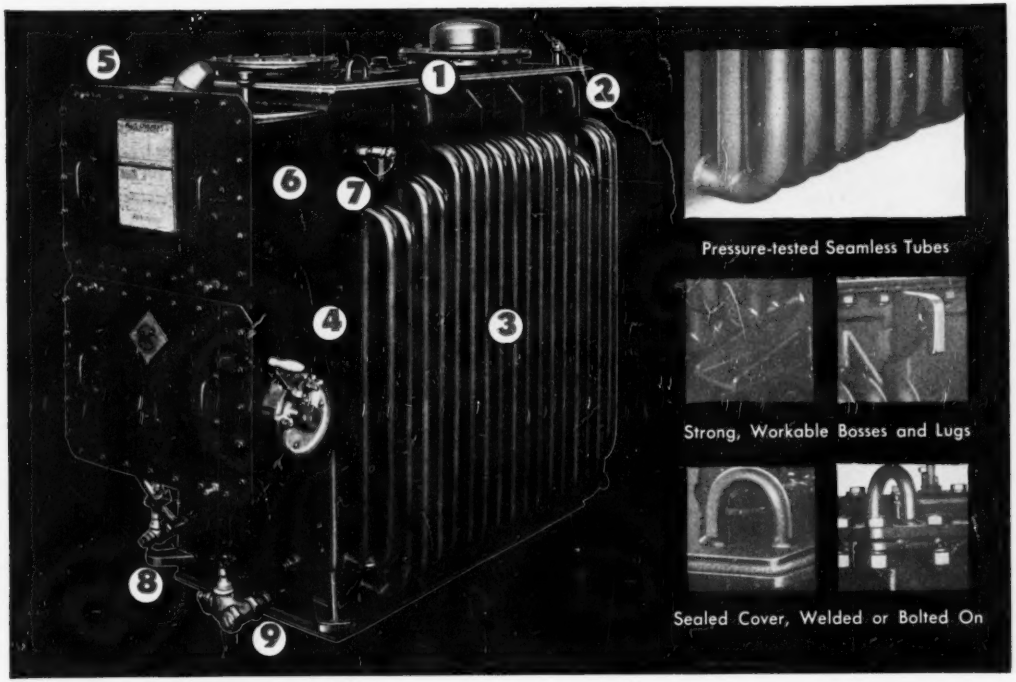
Address inquiries to any of the following manufacturers of

Certified Starters

The Arrow-Hart and Hegeman Co., Hartford, Connecticut
The Bryant Electric Co., Bridgeport, Connecticut
Chatham Electronics Corporation, Newark, N. J.
Dura Electric Lamp Co., Newark, N. J.
General Electric Co., Bridgeport, Connecticut
Harvey Hubbell, Inc., Bridgeport, Connecticut
Instant Glow Starter Corporation, New York, N. Y.
Kuthe Laboratories, Inc., Newark, N. J.
The Lloyd Products Co., Providence, R. I.
Pass & Seymour Co., Syracuse, N. Y.
Sheldon Electric Co., Irvington, N. J.

BEAT CORROSION! FLOODING! SUBMERSION!

With Allis-Chalmers Network Transformers



SERVING concentrated metropolitan loads, Network Transformers must operate dependably under the most adverse conditions.

These TANK CONSTRUCTION FEATURES show how Allis-Chalmers builds Network Transformers to combat corrosion, flooding, even complete submersion: —

1. Heavy tank cover (½" thick), welded or bolted on.
2. Guide angles on inside of tank wall provide positive positioning of core and coils.
3. Heavy gauge steel tank . . . seamless drawn radiating tubes. All nuts, bolts etc. galvanized.
4. Switch case and terminal chamber welded directly to main tank eliminates gasketed joint and reduces overall height.
5. Three coats of paint — each coat flow painted and baked on.
6. Seams and joints externally welded to eliminate crevices.
7. Tanks and cooling tubes are pressure tested far in excess of operating conditions.
8. Jack bosses free of obstructions for convenient lifting.
9. Design of base permits free rolling in any direction — provides for under-tank ventilation.

For the *complete* story of A-C Network Transformers — including circular core and coil design, no-load tap changer, accessories etc. — contact your nearby district office. Or write for fact-packed 24 page bulletin 61B6152A. A 2601

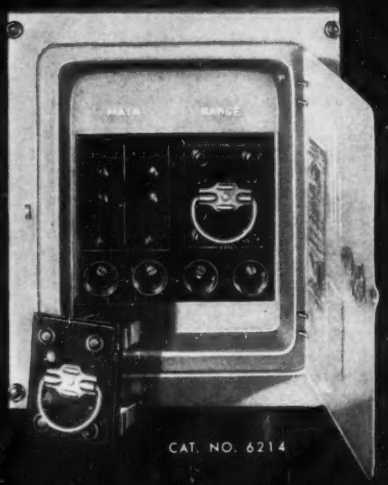
ALLIS-CHALMERS, 939A SO. 70 ST.
MILWAUKEE, WIS.

ALLIS-CHALMERS

Network Transformers — Nearly 1,000,000 KVA Installed

The switch is to

GENERAL



CAT. NO. 6214

ENCLOSED SAFETY SWITCHES • SERVICE ENTRANCE EQUIPMENT
BRANCH-CIRCUIT OR RESIDENCE PANELS • PANELBOARDS FOR
LIGHT AND POWER DISTRIBUTION

MORE AND MORE Electrical Contractors Specify "GENERAL"

GENERAL
SWITCH CORP.

45 ROEBLING STREET, BROOKLYN 11, N. Y., U. S. A.

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*Baltimore, Md.	Cleveland 16, Ohio	Indianapolis 4, Ind.	Phoenix, Arizona	*Seattle 4, Wash.
Birmingham, Ala.	Dallas 5, Texas	*Los Angeles 13, Cal.	*Portland 9, Oregon	Spokane 8, Wash.
*Boston 10, Mass.	*Detroit 26, Mich.	*Minneapolis 2, Minn.	Princeton, Indiana	St. Louis 8, Mo.

*WAREHOUSE STOCK MAINTAINED

EXPORT OFFICE: NEW YORK 11, N. Y.

Here's what they're Saying about the NEW NATIONAL ELECTRIC PLUG-IN STRIP!

"We have found Plug-In Strip to be all you claim for its ease of installation on the job, the saving of labor, the complete service it renders and the economy as compared to individual outlets."

Electrical Contractor

"Plug-In Strip lends itself to a multiplicity of applications, and we now have not only electrical contractors, but also department stores and industrial accounts using this type of convenience outlet system."

Electrical Wholesaler

"We have several contracts on office buildings that were awarded after the brick walls had been erected and the tenant space not yet sub-divided.

The problem was how to get an adequate number of outlets to meet unknown demands with a minimum amount of brick and concrete cutting. We found Plug-In Strip to be the perfect answer."

Electrical Contractor

"In our new office addition, we have used LOPO-TRIM to carry telephone circuits and CF2 606-18 PLUG-IN STRIP in 110v outlets for office equipment."

Manufacturer

"Your new Plug-In Strip with its cut-in-the-field feature and fast method of connection is a big improvement."

Electrical Contractor and Engineer

"Especially in renovating, we found that Plug-In Strip installed very smoothly, eliminating considerable amount of breaking into the structures . . . We are proud of our installations, have made profitable jobs, and lastly our electricians like to work with it."

Electrical Contractor

"We have found that there is no waste, and Plug-In Strip was very easy to install."

Electrical Contractor

"In every case the installation of the required number of duplex outlets would have been more costly than Plug-In Strip. Also we found Plug-In Strip to be very profitable material to use."

Electrical Contractor

"I have installed Plug-In Strip throughout my new ranch house."

Home Owner

"We are more than pleased with this 'low-cost' method of adequate wiring, and recommend it for stores, homes, industrials, hospitals, hotels and anywhere that adequate outlets are required."

Electrical Contractor

"In some of the residences we have built, we have used your Plug-In Strip exclusively rather than the conventional duplex receptacle arrangement."

General Contractor

"Industrially, the uses of Plug-In Strip are innumerable . . . We have used the strip to great advantage on electrical work-benches, radio work-benches, etc. It allows the use of soldering irons, small electric motors, light welding, etc., all at the same time."

Electrical Contractor

Excerpts from letters. Names on request.

Write for THIS CATALOG TODAY!

You'll like this revolutionary multi-outlet assembly too. It gives you a S-P-R-E-A-D of electrical outlets —spaced every 6" or 18" apart.

- No soldered or screwed connections.
- A cut-in-the-field product.
- Capping permanently locked on.
- Listed by Underwriters' Laboratories, Inc.

National Electric
PRODUCTS CORPORATION
PITTSBURGH 30, PA.

National Electric Products Corporation
1310 Chamber of Commerce Building
Pittsburgh 19, Pa.

Please send me your Catalog CF-2 on the NEW NE Plug-In Strip.

NAME .....

ADDRESS .....

.....

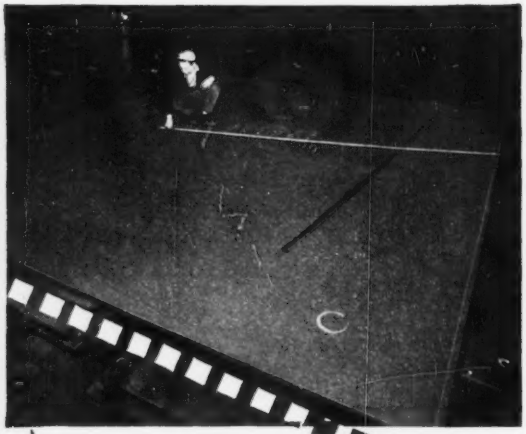
TANK CONSTRUCTION

ANOTHER IMPORTANT PHASE IN THE MANUFACTURE OF

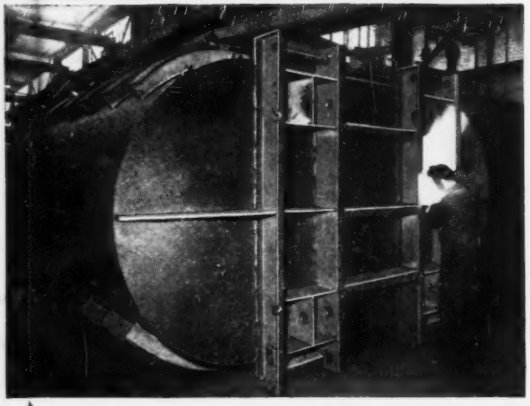
The importance of good tank design and construction is sometimes overlooked by purchasers of power transformers. Tanks which are poorly designed and improperly built can result in extra installation and maintenance expense.

A transformer tank must be a ruggedly-built structure, not only to support the weight of the core-and-coil assembly, oil, and various auxiliary parts, but also to withstand, without distortion, the stresses and strains imposed upon it in shipment and installation.

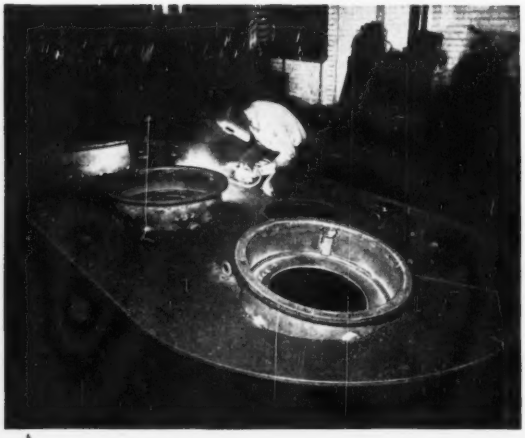
It is because Moloney has long recognized the importance of proper tank construction, that you will find Moloney transformer tanks particularly well-designed and well-built.



1 Next in line of importance to the engineer's job of designing the tank, is that of the layout man in accurately marking the steel plates and shapes for other workmen to perform the cutting, bending, and welding operations which convert these materials into a completed tank.



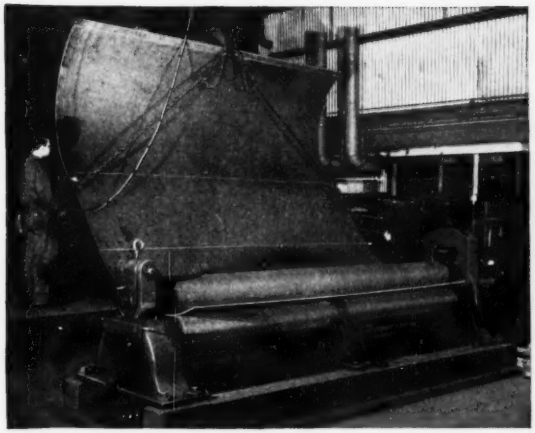
4 In order to support the tremendous weight of a large power transformer the base must be strongly constructed. Here we see the steel reinforcing structure being welded to the tank base. Heavy steel beams and channels prevent distortion and provide weight support, enabling the transformer to be moved on its own wheels or on rollers, without damage.



5 The tank cover must not only provide a weather-proof, gas-tight seal, but must also support the bushings. Photo shows bushing collars being welded to cover. Since bushings used on large, high voltage power transformers are quite heavy, steel reinforcements are welded to the underside of the cover. After completion of this operation the cover is punched for bolting to the tank.

MOLONEY

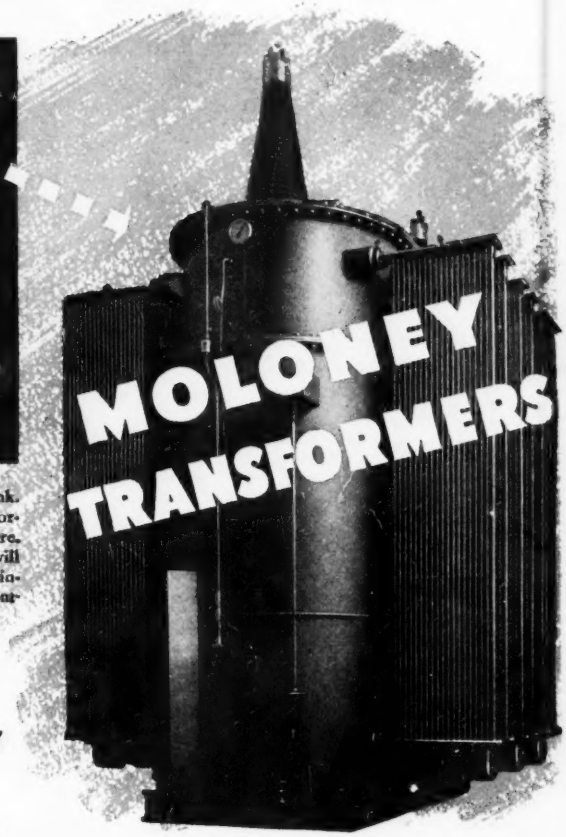
POWER AND DISTRIBUTION TRANSFORMERS EXCLUSIVELY SINCE 1896 • FACTORIES AT ST. LOUIS,



2 Here we see steel being rolled to form a section of the tank wall. The workman is operating the overhead electric crane holding the steel while the rolls operated by another workman curve the steel plate according to the layout man's markings. As this operation progresses, it is checked again and again until the exact shape specified is obtained.

3 After shaping, the tank sections are welded together by means of automatic seam welders. The seams are welded both on the inside and outside. Shown here is the inside seam welding operation. After this, heavy steel angles or Z bars are welded to the tank wall to provide reinforcement, enabling tank to withstand, without distortion, pressure of the cooling oil and stresses encountered in shipment and installation.

6 Shown here is the final inspection of the transformer tank. Every welded seam, and every connection point is thoroughly examined for possible leaks under air pressure. The inspector is covering the seams with a liquid which will indicate even the most minute leak. After this careful inspection the tank is completely sand blasted and then painted before the core-and-coil assembly is installed.



ELECTRIC COMPANY

MISSOURI AND TORONTO, ONTARIO, CANADA.

Cole Electric Co.

8439 Steller Drive Culver City, Calif.

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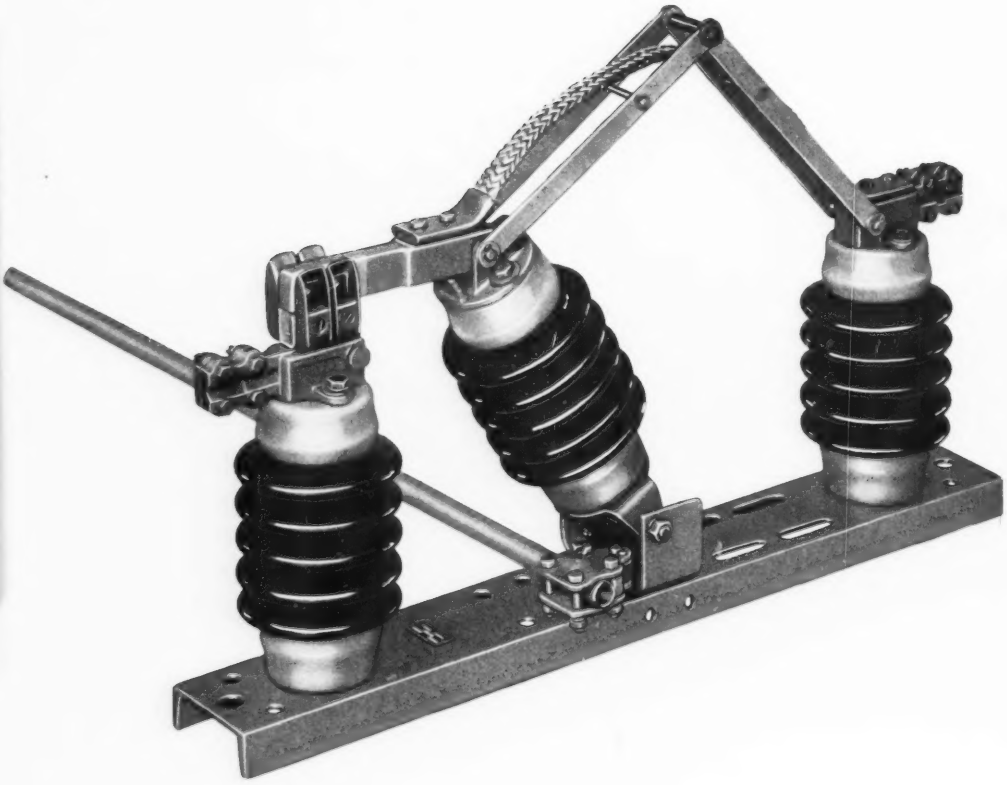


OUTDOOR DISCONNECTING SWITCH
Vertical Break; 15 KV.—400 Ampere
3 Pole—Single throw—Group operated
One Pole Shown
See Bulletin 33A

Simplex Varnished Cambric Cables are the work horses of the electrical industry. As shown, this cable has three conductors with a thick wall of varnished cambric tape. A varnished cambric belt for additional electrical protection is added and then a lead sheath is applied. A non-migrating lubricating compound is used between layers. It gives the cable greater flexibility and prevents wrinkling of the tapes when the cable is bent.

Simplex Varnished Cambric Cables have exceptional electrical stability and the ability to withstand ozone, mineral oil, voltage surges and high temperatures. They can be bent to a much shorter radius and are less likely to be injured in jointing than are paper cables.

Varnished Cambric Cables may be protected by treated braids, rubber or reinforced rubber jacket, interlocking metal tape (Condex), lead sheath with or without armor. In wet places or where they may be exposed to appreciable amounts of moisture, they must be covered with a lead sheath.

Bulletin #108 will be sent promptly upon request.

Simplex WIRES & CABLES

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

Installing electrical conduit?

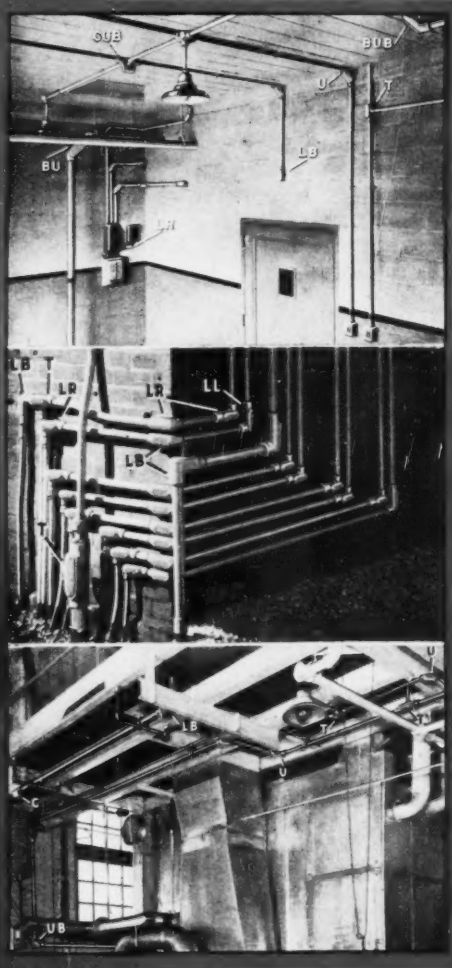
It's much **easier** with

Obround CONDULETS*

because they are so handy and there are

49 different types

A wide variety of interchangeable covers and wiring devices with Crouse-Hinds' exclusive Wedgenut Fastener; sizes to fit ½ to 6-inch electrical conduit.



A Nationwide Distribution Through Electrical Wholesalers

*CONDULET is a coined word registered in the U. S. Patent Office. It designates a product made only by the Crouse-Hinds Company.

The complete Obround Series, together with 15,000 other items for the electrician, is listed in Crouse-Hinds Condulet Catalog.

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CROUSE-HINDS COMPANY OF CANADA, LTD., Main Office and Plant: TORONTO, ONT.

CONDULETS · TRAFFIC SIGNALS · AIRPORT LIGHTING · FLOODLIGHTS

look what's happened to... your capacitor dollar!

It Buys 4 Times as Much as in 1930

Capacitor units were $21 a kilovar in 1930. Even at that price—and at that time—they opened up an attractive, low-cost way to release system capacity.

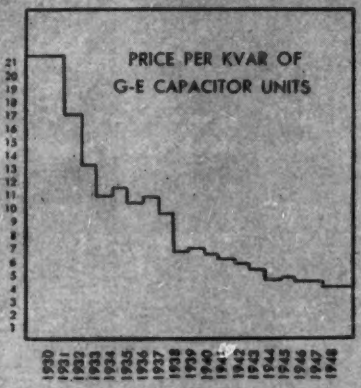
Today, capacitors are less than $5 a kilovar! In terms of dollars per kilowatt released, they are one of the most attractive investments you can make.

Behind this remarkable cost reduction, you see the familiar American cycle—mass production, lower prices and swelling demand. But that is not all. You see a continuing series of brilliant design accomplishments, as shown at the right. These advances accelerated the cost-reduction cycle to the point where you now get four capacitors for the price of one in 1930.

It Means You Can Release System Capacity for as Little as $20 a Kilowatt

Yes, $20 a kilowatt! That is why—with costs up, dollars scarce and power reserves low—more and more utilities are putting capacitor installation high on the job list of their busy line crews.

What's more, your capacitor dollars can release kilowatts *quickly*—in a matter of a few weeks or less. For more information—or for the assistance of a G-E application engineer, contact your G-E sales representative. He is ready to give you quick help and short shipment. Apparatus Dept., General Electric Company, Schenectady 5, N. Y.



The steady drop in G-E capacitor prices has gone hand in hand with a greatly expanding use of capacitors, and with the following major improvements in design that have made the capacitor one of the most dependable types of electric equipment available today:

1930 G.E. introduced thin kraft paper, making possible in

1930 The first oil-filled, 10-kvar individual unit.

1931 G-E introduced Pyranol, which so reduced size and weight that in

1932 G.E. introduced the first 15-kvar unit.

1937 The first outdoor individual unit for distribution circuits, introduced by G.E.

1947 G.E. introduced the permanent hermetically-sealed glass bushing.

1947 The first 25-kvar unit introduced by G.E. made possible by new, improved kraft paper.

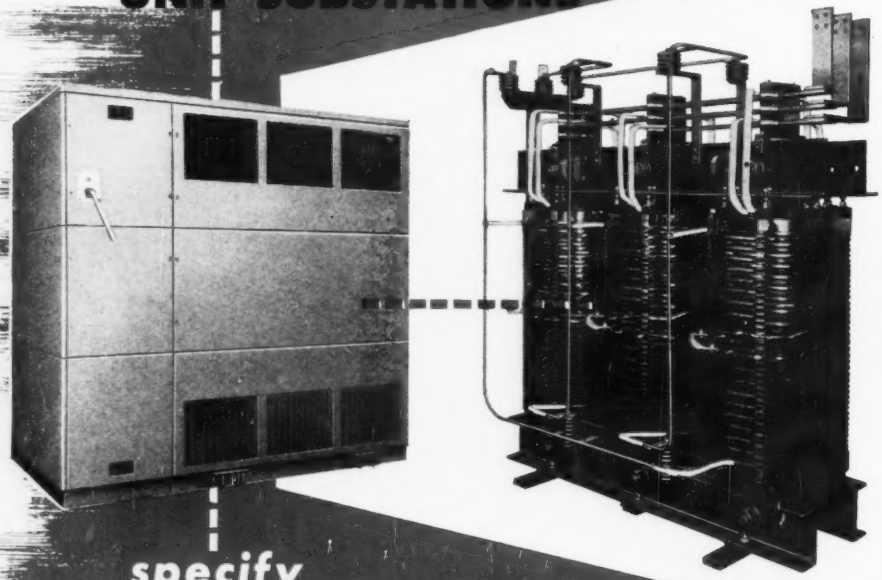
1948 G.E. introduced the first 3-kva, 240-volt capacitor for secondary house feeder lines of distribution transformers.

GENERAL ELECTRIC

411-6

when buying

UNIT SUBSTATIONS



specify

Wagner TRANSFORMERS

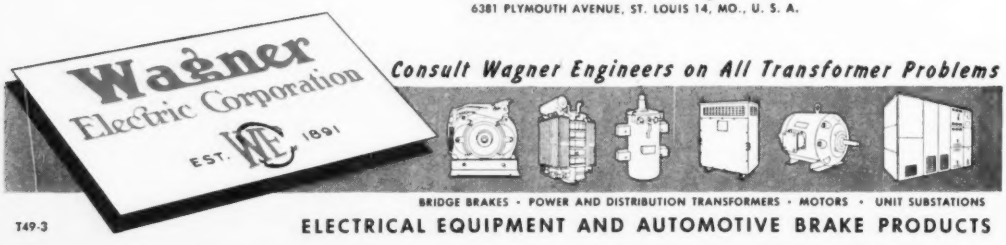
AVAILABLE IN RATINGS FROM 100 TO 2000 KVA

More than fifty years of transformer building experience has been incorporated in the design and construction of Wagner dry-type load-center transformers. Especially developed to meet industry's need for larger transformers for use in plant power distribution circuits, these units are compactly housed in neat, attractive enclosures, which can be arranged to include primary and secondary switchgear compartments to form readily accessible, closely-coupled unit substations. Complete enclosure of all equipment protects against accidental contact with live parts. Relatively light in weight, so they can be used in multi-story buildings, they are readily adaptable to any installation requirement.

Bulletin TU-56 describes in detail the transformers, the enclosures, the various types of incoming line sections available, and the optional equipment and accessories that can be furnished. Write for your copy today.

Wagner Unit Substation Transformers are also available in oil-filled and Noflamol types. Bulletin TU-181 gives information on the complete line of Wagner Power Transformers.

Wagner Electric Corporation
6381 PLYMOUTH AVENUE, ST. LOUIS 14, MO., U. S. A.

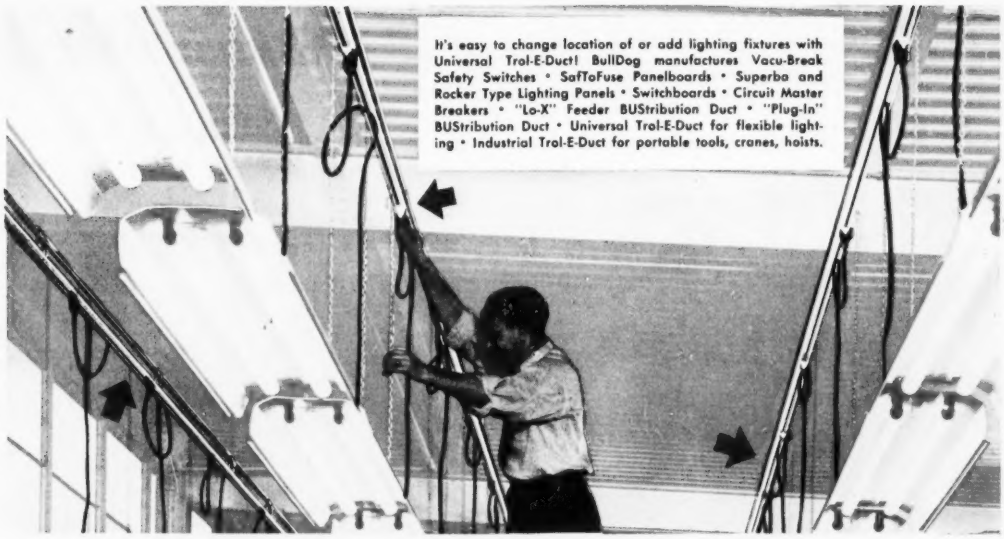


Consult Wagner Engineers on All Transformer Problems

BRIDGE BRAKES • POWER AND DISTRIBUTION TRANSFORMERS • MOTORS • UNIT SUBSTATIONS

749-3

ELECTRICAL EQUIPMENT AND AUTOMOTIVE BRAKE PRODUCTS



It's easy to change location of or add lighting fixtures with Universal Trol-E-Duct! BullDog manufactures Vacu-Break Safety Switches • SafToFuse Panelboards • Superba and Rocker Type Lighting Panels • Switchboards • Circuit Master Breakers • "Lo-X" Feeder BUStribution Duct • "Plug-In" BUStribution Duct • Universal Trol-E-Duct for flexible lighting • Industrial Trol-E-Duct for portable tools, cranes, hoists.

Highlights on low lighting costs

HAVE you ever looked into the cost of a simple job like moving or adding a fixture in an ordinary lighting system?

First, there are new materials — wire, conduit, junction box, outlet box, hangers, etc.; then, labor expense for splicing, threading, bending, taping, etc.; finally, loss of production while power is shut off for connections.

There is no need to see profits drain away like this. Plug the leak with BullDog Universal Trol-E-Duct.

BullDog Universal Trol-E-Duct is a flexible electrical system providing current *where* you want it, *when* you want it. Every inch of the enclosed copper bus bars in Universal Trol-E-Duct can be utilized as an outlet for lighting fixtures. You can plug in for current at any point along its slotted duct. Bus bar capacity: 50 Amps., 250 Volts.

BullDog Universal Trol-E-Duct is 100% salvable, thus lends itself to major or minor plant changes. Simply dismantle prefabricated parts and reinstall to meet your new requirements. *Not a single piece need be scrapped.*

Ask your local BullDog Field Engineer to show you a Universal Trol-E-Duct installation in your own neighborhood.

BullDog's Field Engineers welcome the opportunity to sit in with you during the early planning stages of a building project. Their knowledge of electrical distribution layout can mean savings in installation costs, as well as efficiency and reliability in actual operation. Why not take advantage of this service?

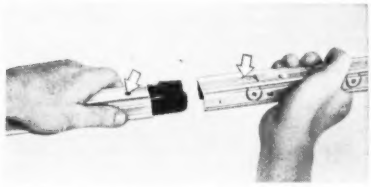
BULLDOG ELECTRIC PRODUCTS COMPANY

DETROIT 32, MICHIGAN • FIELD OFFICES IN ALL PRINCIPAL CITIES

IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO

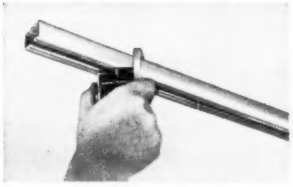
BULLDOG

HEADQUARTERS FOR ELECTRICAL DISTRIBUTION



BullDog Universal Trol-E-Duct is prefabricated in one to ten foot lengths for easy installation. A variety of couplings with specialized purposes join sections. Connections slip together; no nuts or bolts.

Terminal Twistout Plug, one of several types used to tap current from Universal Trol-E-Duct. Duct also accommodates movable trolley-type outlets.



Inserting a twistout plug is easy. Contact end is inserted in slot and twisted. "L"-shaped supporting fingers slide easily over top of duct.

CONSULT THE FOLLOWING PACIFIC COAST REPRESENTATIVES:

Coast Electric & Manufacturing Co.
1720 N.E. Sixth Avenue Tel. Garfield 2844
Portland 12, Oregon

Safety Switchboard Company
1445 Stevenson St. Tel. Hemlock 1-2470
San Francisco 3, Calif.

Mullenbach Electrical Manufacturing Co.
2300 East 27th Street Tel. Logan 5-5331
Los Angeles 11, Calif.

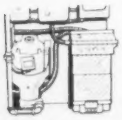
You know you're right with "G-E White"

Each step in the manufacture of General Electric White rigid conduit, from raw material to final inspection, is carefully controlled to bring you a uniform, high-quality product. Interior and exterior surfaces are smooth...threads are sharp and clean-cut. Finish is hot-dipped zinc, with an additional coating of baked-on Glyptal lacquer.

Always, when you think of conduit for protection from atmospheric corrosion, think of "G-E White." For further information, see your nearest General Electric Construction Materials distributor, or write to Section C14-125, Construction Materials Department, General Electric Company, Bridgeport 2, Connecticut. *Trade-mark Reg. U. S. Pat. Off.

GENERAL ELECTRIC

RACEWAYS ROUNDUP
with your
GENERAL ELECTRIC
Construction Materials Distributor



If you're wondering how to get raceway protection for wiring in cramped quarters, for machine tool or temporary wiring, General Electric flexible steel conduit is the answer. This conduit is strong, yet very flexible. It's quickly installed, and the zinc-coated strip steel is wound in a way that makes wire pulling easy.

Don't forget General Electric EMT for those light jobs that don't require the heavy-duty protection of rigid conduit. You'll like the way lightweight EMT can be easily handled . . . easily bent . . . quickly installed with threadless fittings. This thin-wall, welded steel tubing has an exterior surface of electrogalvanized zinc and an interior of corrosion-resisting enamel.

General Electric switch and outlet boxes are made in a variety of sizes, shapes, and depths for every purpose. Most are available either galvanized or with black-enamel finish. All cable and conduit boxes have improved knockouts, are easy to install, and have the approval of Underwriters' Laboratories, Inc.

On your next order, why not try the time-saving, "one-stop, one-package" service that your General Electric distributor can supply? Because he carries the complete General Electric line, you can order every item you need from him. No need to run around getting part of your requirements in one place and part in another. It's the kind of service busy contractors need to help stretch scarce working hours.

Conduit Products

One Unit! One Order! One Responsibility!

That's How Easy . . . How Sure . . . it is when you use FWD's simple BUILT-TO-CODE Chart to select the Right FWD Truck for your Specific Needs

JUST imagine the time you save . . . the trouble you by-pass when you select a *built-to-code* unit for line construction or maintenance work with the help of FWD's handy code chart.

You quickly see the 38 varying — yet standardized — combinations that are available and the specific equipment each FWD carries.

You easily order the FWD you want because each unit is designated by an individual code number.

You issue only one order because FWD engineers and builds the *complete* unit — truck and equipment. That's why — when your FWD is delivered — it's ready to go to work immediately.

What's more — with FWD supplying the complete unit — buck-passing is eliminated. FWD accepts full responsibility.

Let FWD's code chart help simplify your equipment purchases. See your Graybar distributor or write us direct.

THE FOUR WHEEL DRIVE AUTO CO.
CLINTONVILLE, WISCONSIN
Canadian Factory: KITCHENER, ONTARIO

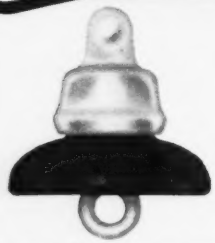
Built-to-Code
MOTORIZED UNITS
FOR LINE CONSTRUCTION
AND MAINTENANCE

Built By FWD

Makers of America's Foremost Heavy Duty Truck

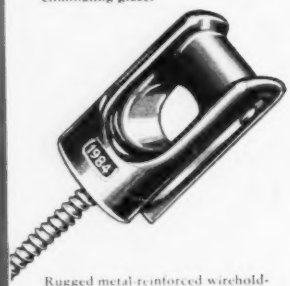
Distributed by GRAYBAR

...for all HIGH VOLTAGE NEEDS call Porcelain Products



Rugged 6" Suspension Insulators—compression glazed for extra mechanical strength. Designed to withstand strain of wind and ice loads.

Pintypes that take a load off lineman's shoulders. Can be furnished with Type "N" radio interference eliminating glaze.



Rugged metal-reinforced wireholders with well rounded wire ways, heavy galvanized steel strap. Semi-float self-aligning action assures proper seating.

SEND YOUR INQUIRY TO

Porcelain Products, Inc.
PARKERSBURG, W. VA.

ELECTRICAL BOOKS

ELECTRICAL CODE DIAGRAMS, by Ben Z. Segal, Code Data Publishers, P. O. Box 247, Atlanta, Ga., Illustrated, 151 pages, 8½x11 in. loose-leaf, photolithography, paper binding, $3. Second of a series on code articles prepared by Mr. Seagall has now been issued. The first book covered articles 200-210 and 220. Book two covers article 230 on services and 240 on over-current protection. Has 300 drawings illustrating code rules. Was designed either to use as a text or for ready reference for those applying code rules.

RADIANT HEATING, by Richard Woolsey Shoemaker, 6x9, 306 pages, McGraw-Hill Book Co., $4. A new treatise on radiant space heating. Covers principles and theory, structural details, plant design, control systems, and methods of installation. Except for cost data the book is a very complete presentation of the theory and practice of radiant heating.

EXPLORING ELECTRICITY, by Hugh Hildreth Skilling, professor electrical engineering, Stanford University, 277 pages, 6x8½. The Ronald Press Co., $3.50. Purpose of the book is to tell something about electricity as the explorers knew it: electricity as Franklin, Henry, Thomson, Galvani, Volta, Ampere, Ohm and others knew it.

TRANSFORMERS, THEORY and CONSTRUCTION, by W. C. Sealey, engineer, transformer design, Allis-Chalmers Mfg. Co., 256 pages, 5½x8½. International Textbook Co., $3. Deals with the history, theory, calculations, construction and application of transformers.

SOURCES OF ENGINEERING INFORMATION, by Blanche H. Dalton, engineering librarian, University of California, 109 pages, 6½x9½. University of Calif. Press, $4. A practical guide to engineering literature and data, designed as a concise reference for engineering students, practicing engineers, research workers and librarians.

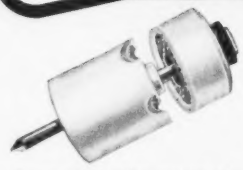
PRACTICAL RESIDENTIAL WIRING, by John F. Nowak, 495 pages, 6x9, D. Van Nostrand Co., $5.95. A practical book on house wiring giving complete information for doing entire electrical jobs. Provisions of the code are applied and explained.

MATHEMATICAL SOLUTIONS OF ENGINEERING PROBLEMS, by Mario G. Salvadori, Columbia University, 245 pages, 6x9, McGraw-Hill Book Co., $3.50. A new text on fundamental engineering mathematics that should have wide appeal because of its general method of approach and the variety of topics covered.

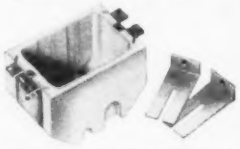
FREQUENCY ANALYSIS MODULATION AND NOISE, by Stanford Goldman, MIT, 434 pages, 6x9, McGraw-Hill Book Co., $6. A mathematical text dealing with certain phases of radio engineering which have become especially important with the development of television and radar.

RURAL ELECTRIFICATION, by J. P. Schaenzer, 6x9, 338 pages, Bruce Publishing Co., $3.76. Dedicated especially to vocational agricultural teachers of high schools. Covers theory, wiring, lighting and electrical applications on the farm.

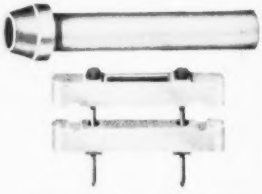
...and for LOW VOLTAGE TOO! call Porcelain Products



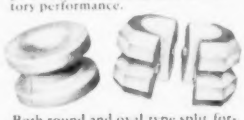
Dense, good looking, positive gripping ALLIGATOR Nail Knobs are preferred by electricians insisting on workman-like installations to build good-will and repeat business.



Outlet boxes with Adjustable Metal Mounting lugs and set of Hangers are nationally famous for durability, ease of installation and safety features.



A complete size range of tubes as well as 2 and 3 wire cleats are available for immediate delivery. Made precisely to give long and satisfactory performance.



Both round and oval type split for-estry insulators as well as telephone insulators are available for immediate delivery.

SEND YOUR INQUIRY TO

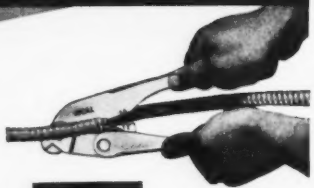
Porcelain Products, Inc.
FINDLAY, OHIO

from the
Land of "MIGHT"
SOARING far above crag and peak, the eagle seeks his nest—so high as to be almost beyond man's reach! And yet, Smith Impulse Turbines, designed for high heads and locations presenting natural barriers, take more than the Gold of Midas from the eagle's realm, by transforming the force of falling water into mechanical energy! Write for Bulletin 147.
S. MORGAN SMITH COMPANY
YORK, PENNSYLVANIA U. S. A.
POWER by SMITH

IDEAL wiring tools

MAKE EVERY WIRING JOB EASIER, FASTER

NEW



IDEAL B-X Armor Cutter

Makes B-X Cutting SAFE. Eliminates hacked and torn fingers — cut and damaged insulation. There's no other tool like it! You just place the cable in the jaws and squeeze handles—than twist the cable and pull apart. Use it for either new small diameter or large diameter B-X, No. 10, 12, or 14 (two or three wire) cable. Cuts anywhere along length of cable for opening into junction boxes, etc. Gets into hard-to-reach places. Special steel cutting blade may be sharpened. 10 inches long; weighs just 12 ounces. End of tool serves as wire cutter. *See and get one today!*

THE SIMPLEST, BEST WAY TO MAKE APPROVED WIRE JOINTS

IDEAL

Wire Nuts®

Patented, No. 1,933,555

(THE SOLDERLESS, TAPELESS WIRE CONNECTORS)

Preferred over all other types because they are FASTER, BETTER—and they cut wiring costs! *Faster*—just screw them on—that's all. No solder, no tape, no tools. *Better* because they make a joint that's stronger, electrically better and more permanent. Can't shake or pull loose. Bakelite shell insulates and covers sharp wire ends. Built to highest precision standards—every one inspected! For all common wire joints from two No. 18 up to three No. 10, solid and/or stranded. Look for the name "IDEAL".

FISH TAPE REEL AND PULLER

3 tools in 1. Gives complete control of fish tape . . . keeps it reeled up . . . prevents springing and breaking . . . helps workmen avoid "live" parts. Makes it a "breeze" to pull tape through conduit. Gives BIG grip. No slipping—easy to reel in or pay out. Six stock sizes.

Cuts "fishing" time 50%. Tape is reeled, unreeled and/or pulled through in one direction.

IDEAL VOLTAGE TESTER

Many superior features! Gives DOUBLE PROTECTION — a solenoid indicator and neon test lamp. Not an ordinary "glo" type—actually indicates nominal line voltage on easy-to-read scale, calibrated from 110 to 600 volts. Tests AC or DC circuits — grounds — blown fuses — frequency, etc. Complete with carrying case.

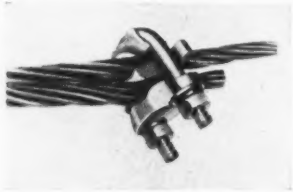
SEE YOUR LOCAL IDEAL DISTRIBUTOR—OR WRITE US

IDEAL INDUSTRIES, Inc. Sycamore, Ill.

PRODUCT NEWS

Connector (100)

A. B. Chance has a new type U-bolt connector with slotted, swinging spacer and bottom clamp, permitting application to parallel conductors without removal of nuts and washers. It is designed for tapping or splicing conductors in substations, on transmission lines and industrial services where high-pressure connections are desired and current values are high. This connector may be applied hot, according to the manufacturer. Three sizes cover a range of conductor sizes from No. 4 solid copper to 500,000 CM. Two types are made. One is heat-treated aluminum alloy throughout. The other has a contact copper top clamp and spacer with a bottom clamp of alloy; U-bolt and nut are Everdur.



Current Transformers (101)

Associated Research Inc.'s Model 313 donut-type instrument current transformers are of the insert primary type, compensated for phase angle and ratio error. Designed for 5 va. burden, they have 2-ft. secondary leads which may be connected direct to the instrument or through suitable switching arrangements where several transformers are to be used with one instrument. General characteristics are such that they fall within NEMA instrument current transformer classification ½, according to the manufacturer. They are insulated for 4,500 volts a-c and may be used on 25 to 133 cycles; are available in ratios from 25/5 to 1,000/5 amp. and in multirange combinations with single primary and tapped secondaries.

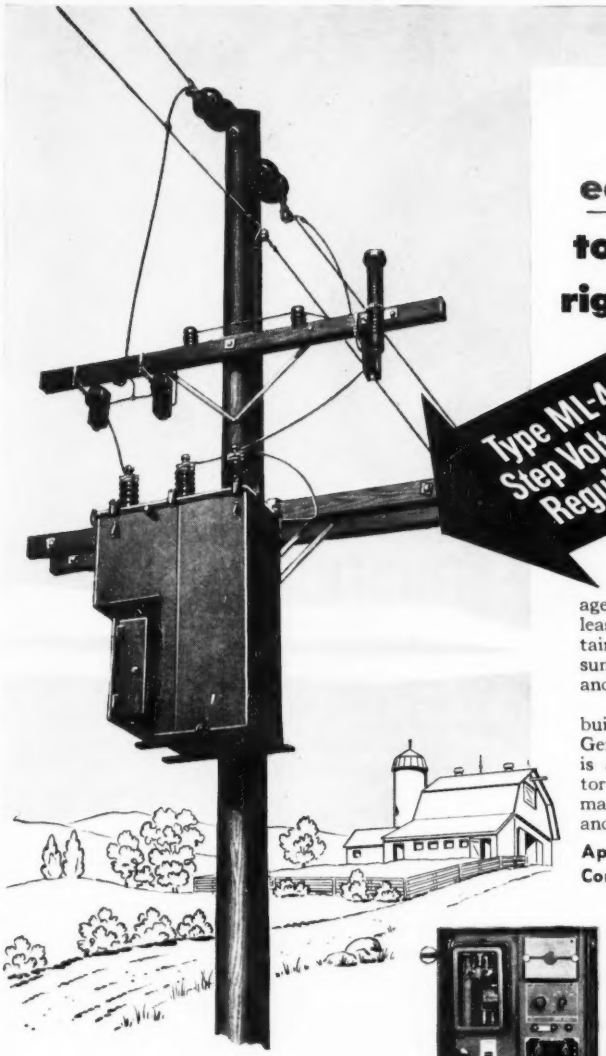
Box Connectors (102)

The new Buchanan box connectors provide for simultaneous clamping of connector on to cable and into box by tightening two screws. Installation is accomplished by hooking bottom tab into knockout, swinging connector to engage rocking clamp and tightening. No. B267 for armored cable and No. R267 for loom wire or non-metallic sheathed cable are approved by Underwriters' and Canadian Standards Assn. for cable sizes 14/2, 14/3, 14/4, 12/2, 12/3 and 10/2, the manufacturer states.

Industrial Mats (103)

A new line of sponge rubber industrial mats and runners is being produced by Atlas Sponge Rubber Co. Standard mats come ½-in. thick x 21½x47 in., with beveled edges; also ½x21½x23 in.; available in black or green; other colors on special order. Runners are available in 47-in. units.

Here's the economical way to keep voltages right on rural lines



Type ML-4 Step Voltage Regulator

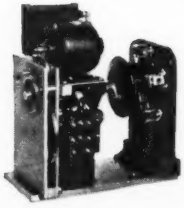
In rural service especially, voltage regulators provide the simplest, least expensive method for maintaining proper voltage to all consumers—for insuring more revenue and fewer complaints.

For a service-proved regulator, built specifically for rural lines, use General Electric's Type ML-4. It is a single-phase step-type regulator—provides ten per cent automatic voltage regulation at low cost, and with minimum maintenance.

Apparatus Dept., General Electric Company, Schenectady 5, New York.

DEPENDABLE, AUTOMATIC CONTROL—

Voltage regulating relay, motor control relay, and other elements of the control panel are similar to those in the more expensive type of induction regulator used at urban sub-stations and important load centers.

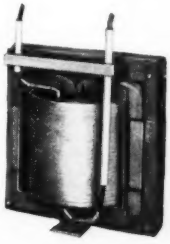


THE SWITCHING MECHANISM—

Shockless, snap-action, Geneva drive assures accurate positioning of contacts and long life. A tap change is completed in 1½ cycles. The complete mechanism operates under oil and requires no lubrication.

SPIRAKORE CORE AND COILS—

The regulating transformer used in the ML-4 step voltage regulator is of Spirakore design—similar to the famous G-E Spirakore distribution transformer, with the flux through the core following the grain direction of the steel, giving smaller size and lighter weight.



GENERAL ELECTRIC

404-58

UNION PACIFIC

Your choice of *Streamliner* service between Chicago and the PACIFIC COAST

Union Pacific's daily Streamliners provide splendid accommodations for both Pullman and Coach passengers. Superb Dining-car meals . . . restful Club and Lounge cars . . . and a smooth roadbed add to the pleasure of your journey—from beginning to end.

Streamliner **"CITY OF LOS ANGELES"**
Between Chicago-Los Angeles

Streamliner **"CITY OF SAN FRANCISCO"**
Between Chicago-San Francisco

Streamliner **"CITY OF PORTLAND"**
Between Chicago-Portland

ALL STREAMLINER COACH SEATS ARE RESERVED

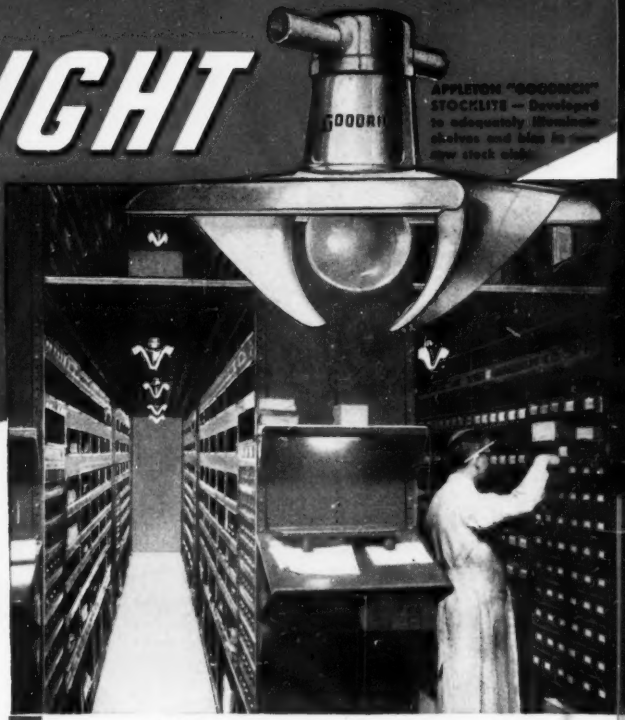
* * *

Also overnight service every night between Chicago and Denver on the Streamliner "CITY OF DENVER."

Daily service on the Streamliner "CITY OF ST. LOUIS" between St. Louis and Denver . . . with through cars to the West Coast.

UNION PACIFIC RAILROAD
Road of the Streamliners

BETTER LIGHT *for the Eyes of Industry*



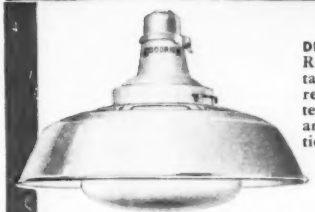
APPLETON "GOODRICH" STOCKLITE — Developed to adequately illuminate shelves and bins in modern stock aisles.

Appleton Lighting Equipment

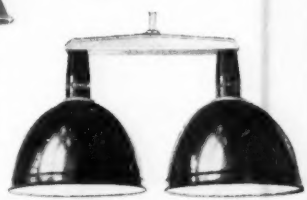
Depend on Appleton Lighting Equipment for the illuminating efficiency that spells better industrial workmanship, smoother production. Make every industrial job you plan a model of better lighting by specifying Appleton fixtures, expertly engineered for superior illumination, lower maintenance.

The Appleton "Goodrich" Stocklite shown above is typical. Diffusing light from eight different reflecting surfaces, the Stocklite provides the proper distribution of light in narrow stock aisles, without spotty distribution or unpleasant glare.

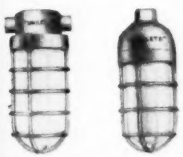
Hundreds of lighting specialties of equally expert design comprise the *complete* Appleton Line of ruggedly built fixtures, meeting virtually every industrial requirement — indoors or out. Now including the famous line of lighting specialties formerly manufactured by the Goodrich Electric Company, Appleton Lighting Equipment points the way to better lighting at minimum service, installation and operating cost.



DISKONECT GLASSTEEL DIFFUSER—Reflector, lamp and globe may be detached from hood as unit, without rewiring. Provides soft, yet high intensity illumination on both horizontal and vertical surfaces without objectionable shadows.



TWIN-HIGHLITE HIGH-MOUNTING FIXTURES—Designed to produce high levels of illumination from a minimum number of outlets in high bay industrial interiors. Easily serviced. Equipped with easy-to-wire channel for mounting on single suspension. Porcelain-enameled.



APPLETON VAPOR-TIGHT FIXTURES—Newly designed. Made of tough malleable iron. Also available in the *complete* Appleton Line are Explosion-Proof and Dust-Tight Lighting Fixtures, blanketing all requirements for hazardous locations.

USE THE BIG APPLETON CATALOG—for convenient purchasing of all electrical equipment. This big buying guide is a fully detailed and graphically illustrated listing of the more than 15,000 items in the Appleton Line — all "STANDARD FOR BETTER WIRING." The Appleton Catalog will be mailed to any user of wiring and lighting equipment immediately upon request.

SOLD THROUGH ELECTRICAL WHOLESALERS

APPLETON ELECTRIC COMPANY

1709 WELLINGTON AVENUE • CHICAGO 13, ILLINOIS

LOS ANGELES 12, 100 N. Santa Fe Avenue

SAN FRANCISCO 1, 655 Minna Street

SEATTLE 9, 115 Ray Street

DENVER 2, 1509 Seventeenth Street

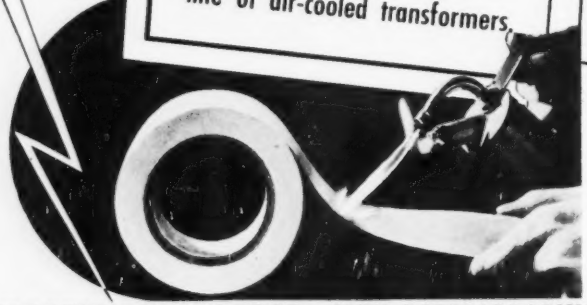
APPLETON ELECTRIC PRODUCTS

APPLETON

CONDUIT FITTINGS • LIGHTING EQUIPMENT • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • REELITES

NEW! A Good Transformer MADE BETTER!

MTC uses the new JOHNS-MANVILLE *Quinterra* insulation throughout its entire line of air-cooled transformers.



INORGANIC • HEAT-PROOF • NON-DETERIORATING ELECTRICAL INSULATION

AIR-COOLED TRANSFORMERS
1 to 1,000 KVA up to 15,000 Volts to meet Individual Requirements

- DISTRIBUTION
- GENERAL PURPOSE
- PHASE CHANGING
- ELECTRIC FURNACE
- RECTIFIER
- WELDING
- MOTOR STARTING

Insulation determines the working life of an air-cooled transformer. Marcus Transformers have always been known for their use of superior Class B and C heat-proof insulation. In this phase of construction, MTC has pioneered many noteworthy firsts. AGAIN, MTC is pioneering in the use of *quinterra* throughout its entire line of air-cooled transformers. That's why when air-cooled transformers are specified or needed, the reputation of Marcus stands pre-eminent in its field. That's why we invite your inquiry with confidence, knowing that once you have utilized a Marcus air-cooled Transformer, you will specify no other.

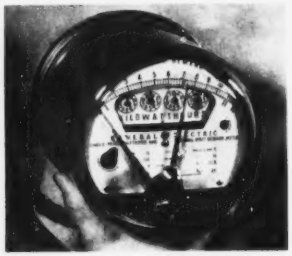
GOOD DELIVERIES • FIRM PRICES
NO ESCALATOR CLAUSES

MARCUS TRANSFORMER CO. INC.
36 MONTGOMERY STREET
HILLSIDE 5, NEW JERSEY

PIONEERS IN THE FIELD OF AIR-COOLED TRANSFORMERS

Sales Representatives
W. R. HENDREY COMPANY
Seattle 4, Washington
E. B. COOK COMPANY
San Francisco, California
ROBERT A. YOUNG & COMPANY
Los Angeles 15, California

Meter (104)



A single-phase combination watt-hour and thermal watt demand meter for industrial use has been announced by General Electric and designated as type IHM-1. It is housed in a slightly larger case than is the conventional watt-hour meter and may be installed wherever rate structures require the determination of demand as well as energy without increasing the size of the original installation. The new damping system and electromagnet of the recently introduced I-50, adapted to the new design, comprise the watt-hour unit of the IHM-1. The thermal unit of the HI-1 thermal meter with its direct-heat operating principle has been adapted for the new combination meter.

Alternators (105)

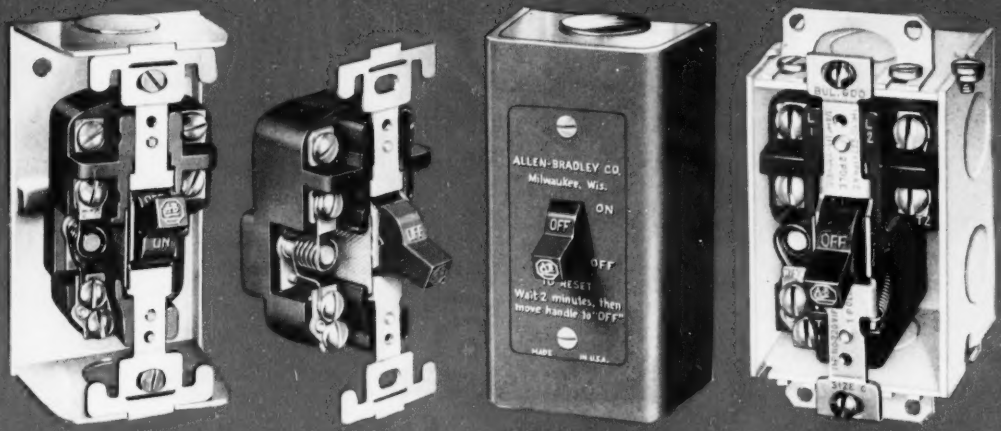
Kato Engineering Co. has added a new series of alternators permitting a top capacity of 300 kw. at 1,800 r.p.m., 60 cycles. The new machine comes at speeds of 720, 900, 1,200 and 1,800 r.p.m. and is available with direct-connected exciter on the high-speed designs and top-mounted exciters on the lower speeds. The rotor is mounted on 3617 and 3620 size Norma-Hoffman cartridge-type bearings. The stator is made of 20-gage coated dynamo steel with $\frac{3}{8}$-in. ventilating air space for each 3 in. of lamination stack. The voltage regulator control panel is mounted on top of the outlet cabinet. These alternators are available with Kato exciters, so arranged that the exciter armature may be removed without dismantling the alternator.

New Damping System (106)

A new electrical damping system said to provide increased sensitivity, quick response and ease of adjustment has been developed for the Allis-Chalmers rocking contact torque motor type generator voltage regulator. This mechanism is a separate assembly designed for rear-of-board or remote mounting. It consists of derivative transformers and a magnetic amplifier. No restriction is placed on the regulator to prevent free movement in correcting a voltage change, the manufacturer states, and damping is applied only when required to prevent undesirable voltage swings.

Insulating Tape (107)

B-Seal, a self-bonding electrical insulating tape, is a new product of the Bishop Gutta Percha Co., which claims that, when applied under normal wrapping tension, this tape coheres to itself and to other insulations to produce a permanent insulating jacket. It is said to have dielectric strength of more than 1,000 volts per mil of thickness and to show no deterioration after 72 hours ozone exposure. Available in 1-lb. rolls of desired width in .020-in. thickness.



Open view of enclosure for surface mounting. | Switch unit without enclosure for machine bases. | Closed view of enclosure for surface mounting. | Bulletin 600 Switch fits into any standard switch box.

Starting Switches with Overload Protection for Fractional Horsepower Motors

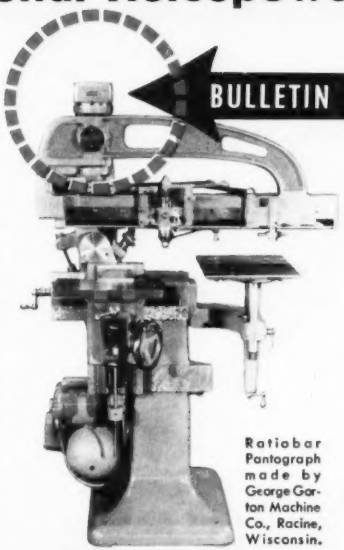
BULLETIN 600 STARTING SWITCH

To satisfy the latest ruling of the National Electrical Code... which requires overload protection for many fractional horsepower motor applications... the Bulletin 600 Starting Switch is the popular answer.

Its self-contained thermal breaker is always dependable. Long periods of inactivity will not affect its accuracy. At the first sustained overload... the switch trips...and the motor is protected against burnout.

Waterproof Enclosure.

The Bulletin 600 Starting Switch cannot be held closed until the overload condition is corrected. This compact control unit is a sales asset to any machine.



Ratiobar Pantograph made by George Gorton Machine Co., Racine, Wisconsin.

Above is shown how easily the Bulletin 600 Fractional Horsepower Starting Switch fits into the standard Allen-Bradley enclosure or into any standard switch box.

The switch unit can also be mounted in any suitable cavity in the machine frame.

For locations requiring enclosures to operate in wet or hazardous locations, there are several standard A-B enclosures to meet every service requirement.

Bulletin 600 Switches are available with pilot lights, selector switches, and other accessories. Send for complete data, today.

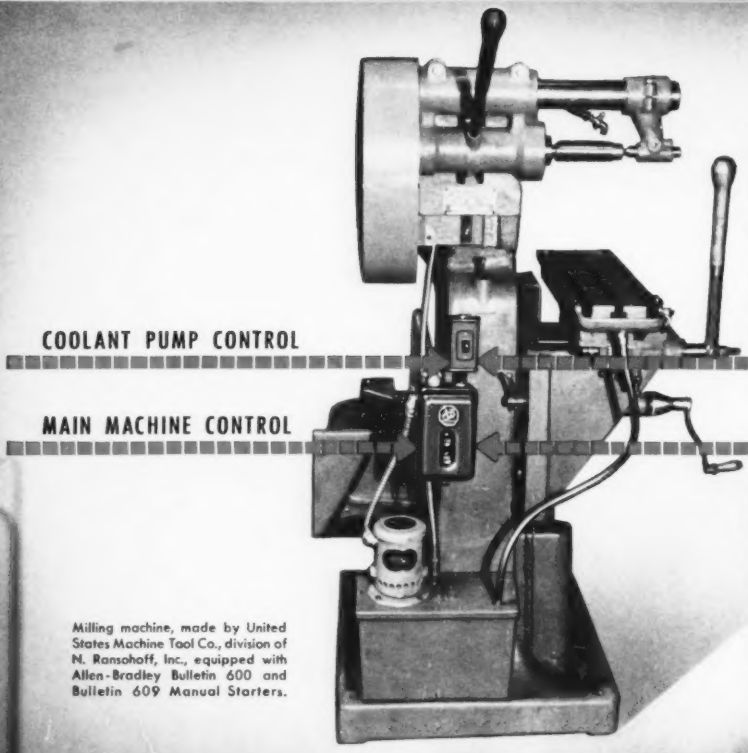
ALLEN-BRADLEY

QUALITY

BULLETIN 600 STARTING SWITCHES

A-B Quality

Allen-Bradley Co.
1316 S. Second Street
Milwaukee 4, Wis.



COOLANT PUMP CONTROL

MAIN MACHINE CONTROL

For motors
1 hp or smaller
use
Bulletin 600
Starting Switch

For motors
over 1 hp
use
Bulletin 609
Starting Switch

Milling machine, made by United States Machine Tool Co., division of N. Ransohoff, Inc., equipped with Allen-Bradley Bulletin 600 and Bulletin 609 Manual Starters.

How to pick the right manual starter

For Motors of 1 hp or less—Specify the compact Allen-Bradley Bulletin 600 Manual Starting Switch. It is so small that it fits easily into any standard conduit switch box . . . with ample wiring space.

A self-contained thermal overload breaker trips the switch when the motor is overloaded. The switch cannot be reclosed until the overload condition is corrected. A full line of enclosures is available for every service application.

Bulletin 609 Starter in steel enclosure. Note white interior and the ample wiring space.

For Motors of 1-5 hp, 220 v—1-7½ hp, 600 v—Specify the popular Allen-Bradley Bulletin 609 Manual Starter, available in enclosures for general, waterproof, dust-tight, and hazardous locations.

Quick-make and quick-break silver alloy contacts . . . double overload breakers . . . and handy push-button operation are a few of the assets of this popular manual starter. Available also for mounting in machine bases.

Send for Third Edition of Allen-Bradley Condensed Catalog . . . . just off the press.

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.

ALLEN-BRADLEY

MANUAL AND AUTOMATIC MOTOR CONTROLS

QUALITY

A-B Quality

Circuit Recloser (108)

R. & I. E. has announced its type MBH automatic circuit recloser designed for 15-kv. circuits. Similar in design to the type MB recloser recently introduced, the new type is normally used for protection of distribution circuits, according to the manufacturer, but its higher capacity permits its use as a substation breaker. Initial trip occurs in 1½ cycles, followed by one or more time delay trips if line trouble is not cleared.

Also announced is new increased interrupting capacity for the type MB recloser (for circuits up to 8.32 kv.), now recommended by the manufacturer for service up to 6,000 amp., with load currents up to 250 amp. This type provides the same 1½ cycle initial tripping and time delay subsequent tripping.

Turbine Pump Motors (109)

Westinghouse has announced a redesigned line of vertical hollow shaft turbine pump motors incorporating advantages of its recently developed Life-Line motors. The new features have been embodied in the vertical hollow shaft turbine pump motors of 1 to 20 hp., frames 224 to 326 inclusive. These new motors are designed to give considerably more power for their weight than equivalent frame sizes in earlier models. They have standardized NEMA dimensions and embody a new type of frame, foot and bracket construction.

Voltage Testers (110)

Square D has two new voltage testers, one for high-frequency alternating systems and the other for low-voltage systems. The former operates on systems ranging from 110, 220, 330, 440 to 550 volts a-c, 400 cycles and 30, 60, 90 and 120 volts d-c. The low-voltage tester is for systems ranging from 12, 24, 36, 48 and 60 volts a-c, 60 cycles to 10, 20, 30 and 40 volts d-c.

Connector (111)

Holub Industries states that Underwriters' approval has been given its Hi Cat. No. 4 universal size Bakelite screw-on wire connector for joining seven No. 18 wires, solid or stranded.

Protective Solution (112)

A protective solution manufactured by Safe-T-Seal Laboratories is claimed to protect electrical systems from electrolytic corrosion and moisture.

At Last! AN ALL-PURPOSE*

Here at last is a dependable, economical insulating varnish that gives outstanding results in all applications except high speed armatures. It's General Electric's new 9574—with characteristics which make it ideal for a wide range of insulating applications. Look at the remarkable features it combines!

Used for Every Type of Winding A simple cure develops excellent physical and electrical characteristics in G-E 9574. That's why it has so many applications. It is particularly suited for repair work. It can be used on every type of winding, including enamel, cotton, asbestos, glass, and Formex.

Easier to Work G-E 9574 is a phenolic drying-oil varnish. Especially easy to use and handle, yet it gives maximum protection as a general-purpose insulation. It has an unusually high flash point of 100 F. And its viscosity of 250 C. P. average (at 45 F) makes G-E 9574 usable at barrel gravity. But you can thin it up to 20% with petroleum spirits.

Cures at Lower Temperature This clear-baking varnish cures at a much lower temperature than most synthetics having similar properties. A baking cycle as low as 212 F is successful in conventional equipment. G-E 9574 lends itself readily to infra-red baking. It sets up into a tough, pliable mass even in the deepest coils. Aging properties are excellent.

FIND OUT MORE

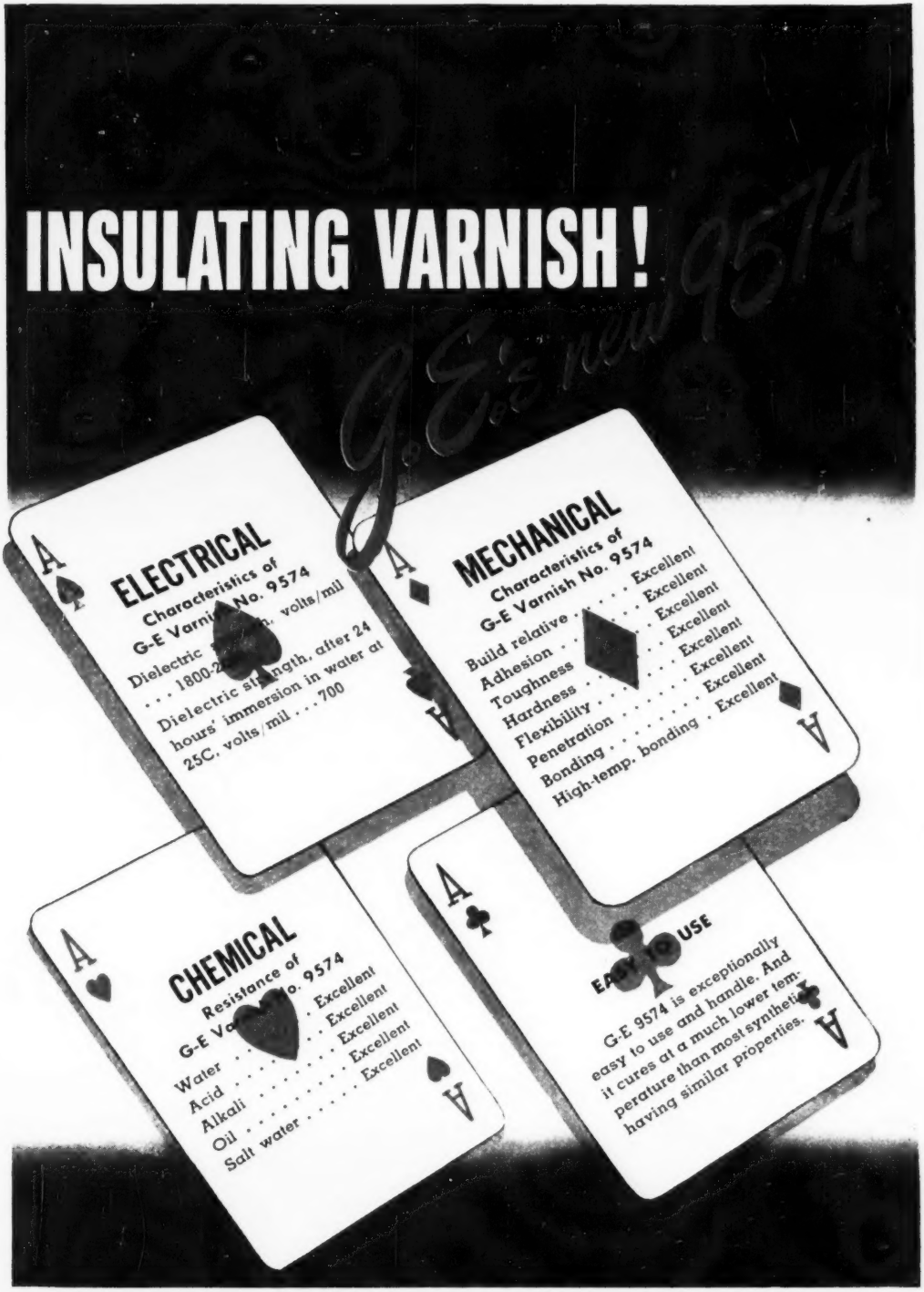
New bulletin gives you full details on G-E 9574. Your local G-E Distributor (including Graybar Electric Co.) has a copy for you, or write to Section 24-1, Chemical Department, General Electric Company, Pittsfield, Mass.

*Except for extra high-speed armatures

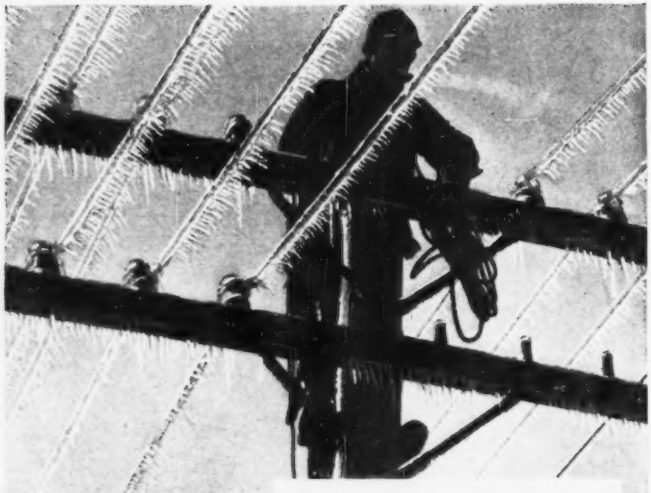
You Can Put Your Confidence in

GENERAL ELECTRIC

ELECTRICAL EQUIPMENT IS NO BETTER THAN ITS INSULATION


INSULATING VARNISH!
G-E new 9574
ELECTRICAL
Characteristics of
G-E Varnish No. 9574
Dielectric
1800-2
volts/mil
Dielectric strength, after 24
hours' immersion in water at
25C. volts/mil . . . 700
MECHANICAL
Characteristics of
G-E Varnish No. 9574
Build relative . . . . . Excellent
Adhesion . . . . . Excellent
Toughness . . . . . Excellent
Hardness . . . . . Excellent
Flexibility . . . . . Excellent
Penetration . . . . . Excellent
Bonding . . . . . Excellent
High-temp. bonding . Excellent
CHEMICAL
Resistance of
G-E Varnish No. 9574
Water . . . . . Excellent
Acid . . . . . Excellent
Alkali . . . . . Excellent
Oil . . . . . Excellent
Salt water . . . . . Excellent
EASY TO USE
G-E 9574 is exceptionally
easy to use and handle. And
it cures at a much lower tem-
perature than most synthetics
having similar properties.

ELECTRICAL EQUIPMENT IS NO BETTER THAN ITS INSULATION



KLEIN PLIERS!

. . . PREFERRED BY LINEMEN

Wherever there are linemen . . . whatever the job—tough or routine—you'll find Klein Pliers.

There's good reason for this widespread preference that began when the electrical industry was in its infancy and has continued on through the years.

Linemen know they can depend upon the quality and performance of Klein Pliers. Drop forged from the finest alloy steel, each pair is individually tempered and tested—has the proper balance—just the right spring to the handles to minimize hand fatigue. A fitted hinge keeps jaws perfectly aligned—the carefully matched knives cut swiftly, surely and stay keen for years.

The complete Klein line includes pliers for every use. Your supplier will fill your order as quickly as possible.

Ask Your Supplier

Foreign Distributor: International Standard Electric Corp., New York

A copy of the Klein Pocket Tool Guide, showing the Klein line and containing valuable tool information, will be sent on request.

Since 1857

Mathias KLEIN & Sons
Established 1857 Chicago, Ill., U.S.A.
1200 BELMONT AVENUE CHICAGO 13 ILLINOIS

Starters (113)

Ward Leonard's Bulletin 4113, size 3 a-c magnetic starters are solenoid operated and are intended for applications where across-the-line, non-reversing starting of polyphase squirrel-cage induction motors and single-phase motors is permissible. Starters are available with open-type construction for built-in on specialized controls, or with NEMA type 1 general-purpose enclosures; may be controlled by separate pilot devices or supplied with local control push buttons or selector switches. Maximum enclosed rating is 50 hp., 440/550 volts, three phase, 60 cycles; standard operating coils can be supplied for 110, 208/220, 440 and 550 volts, 25- or 50/60-cycle service. Dual voltage coils can be furnished for 110/220- or 220/440-volt, 60-cycle operation.

Steel Mill Motors (114)

Crocker-Wheeler Electric Mfg. Co. has announced addition of the AISE standard 600 series to its line of d-c steel mill motors. This motor is adaptable for use totally enclosed non-ventilated or separately ventilated; can be furnished also for self ventilation, according to the manufacturer.

Induction Motors (115)

A new line of extra-low-starting kv.a. squirrel-cage induction motors is announced by Electric Machinery Mfg. Co. Called Design X, the line is available in flange-mounted type and coupled two-bearing type for direct coupling to 514-, 600- and 720-r.p.m. air compressors.

Fractional Horsepower Motors (116)

The Hoover Co. has introduced a new line of fractional horsepower motors built to NEMA mounting standards. They are available in ratings of ¼, ⅓ and ½ hp.; are single-phase, 1,725-r.p.m., dual-voltage, capacitor-start motors; may be furnished with sleeve or ball bearings.

Small Meter (117)

International Instruments Inc. has developed a midget meter, 1 in. in diameter with a scale arc of 270°. According to the manufacturer, this instrument was developed for aircraft and is expected to be used in radio and television fields and for laboratory test equipment.

Time Switch (118)

Miller-Harris Instrument Co. is making a new plug-in-type time switch, model 8P, for operating poultry lights automatically. This control may be plugged into any 115-volt, 60-cycle outlet and cords going to the dim and bright lights are plugged into outlets on the control.

Slide Switches (119)

Two slide switches have been announced by Stackpole. Type S8-26 is a SP, ST switch and S8-26-1 is SP, DT. Both are rated at 1 amp. at 125 volts d-c or 3 amp. at 125 volts a-c and are Underwriters' approved.

Brush Clearance Tool (120)

A device to reduce brush to chips following line clearance work is being offered by Asplundh Tree Expert Co., under the trade name the Chipper.

overcoming an underwater problem for the Northern Pacific

▶ Spanning the St. Louis River, linking Duluth, Minn. to Superior, Wisconsin, swing bridges are operated by the Northern Pacific Railway, "Main Street of the Northwest." Heavy traffic depends upon their smooth electrical opening and closing. For these conditions the railroad wanted a submarine power cable of exceptionally long-lasting service life.

The choice was an Okonite submarine cable. The installation called for 3600 feet of 3-conductor cable. Conductors: Okoloy-coated for corrosion resistance, Semicon-taped to prevent internal corona cutting. Insulation: long-lived Okolite. Armor: Galvanized steel armor wire. O. D. of cable: 2.390". Weight: 5 lbs. per foot.

While moisture-resistance is, of course, an essential, perhaps the most important single factor in this cable's selection is the consistently stable electrical characteristics of Okolite high-voltage insulation even when submerged without an outer lead sheath.

Utilities, carriers, industrial plants use many kinds of Okonite cables — for wet locations, for hot spots, for extreme flexibility, for indoor and outdoor use above or below ground including direct burial. Write for Bulletin WE-1036. The Okonite Company, Passaic, N. J.

6879

OKONITE OKONITE SINCE 1878 **insulated wires and cables**

THE BEST CABLE IS YOUR BEST POLICY

THE MAGNO-TRONIC FLUORESCENT STARTER

PROTECTS Fully automatic thermal relay with unusually long life that eliminates blinking lights and protects all auxiliary equipment.

SIMPLIFIES Replacement of worn-out lamp automatically restores closed circuit—replacement of starter unnecessary. No button to push.

REDUCES COSTS Magno-Tronic starters provide exact timing in the lamp electrode—preheating process preventing excessive loss of emission material thereby assuring the maximum in the useful life of a lamp. The established quality of this starter saves considerable time in maintenance and man hours required to repair and/or replace an inoperative lighting unit.

VERSATILE Will operate efficiently over an extended voltage under widely varying temperatures.

GUARANTEED FOR ONE YEAR

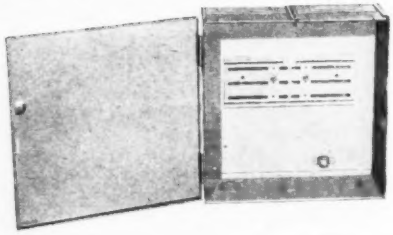
The (SP-15-20) for use with either 15 or 20 watt lamps
The (SP-30-40) for use with either 30 or 40 watt lamps
The (SP-100) for use with 100 watt lamps

Ask for descriptive literature

INDUSTRIAL ELECTRONICS CORP.

MAIN PLANT Newark 2, N. J.

#1130 DUPLEX CABINET—For use with two single phase or two polyphase meters, with facilities for respective test equipment. Incorporates standard twist-outs, and FOR THE FIRST TIME, A TWIST-OUT FOR THE LINCOLN DEMAND METER.

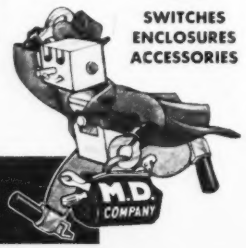


Supplied with seven concentric knockouts for ¾", 1" and 1¼" conduit, test switch bridge. Ample wiring space 15¼" x 15½" x 4½" deep.

SWITCHES
ENCLOSURES
ACCESSORIES

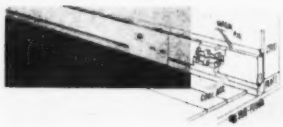
WESTERN SALES REPRESENTATIVES

FRED W. CARLSON, 307 Wall St., Seattle, Wash.
JOHN G. CORRIN, 600 S. Highland Ave., Los Angeles 36, Calif.



METER DEVICES
COMPANY • CANTON, OHIO

Baseboard Heater (121)



A new electric baseboard heater developed by Wesix Electric Heater Co. is 5 in. high, 1⅝ in. in from the stud; combines convection and radiation to warm air, floors and walls. According to the manufacturer, it has a capacity of 105 watts per linear foot, sufficient to heat an average-size insulated home up to a design temperature difference of 70°F. Units are connected in parallel on 240-volt circuits. Four standard lengths are available with a thermostat and switch control section for each room. All-steel construction, finished in high-temperature baked enamel.

Hanger (122)

Appleton Electric Co. is offering type SSH safety swivel hanger furnished with cover and for use with 1½- to 4-in. deep concrete boxes and 4-in. octagonal boxes measuring 1½ or 2⅛ in. deep. Weight of the suspended unit is borne by a fixture stud and does not rely upon screws and screws ears of the box or ring for support, the manufacturer states.

Grounding Box (123)

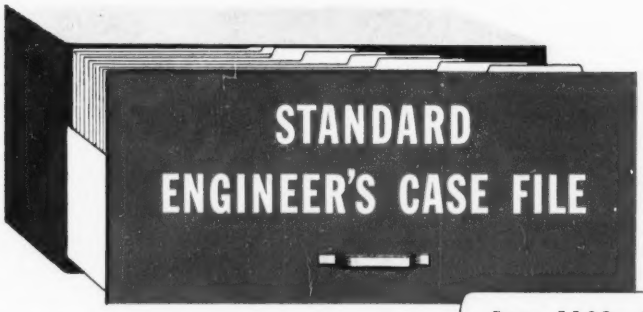
Designed to meet the requirements of most fluorescent fixtures, Wiremold's No. 5738F grounding box accepts both 500 and 700 Wiremold. In addition to serving as a means of grounding the raceway, it provides a means for protecting splices coming in contact with combustible materials, the manufacturer states. The box is 8 in. long, 3⅛ in. wide, ⅞ in. deep and has raised section with ½-in. knockout for no-bolt fixture stud. It is listed by Underwriters' Laboratories.

Lamp (124)

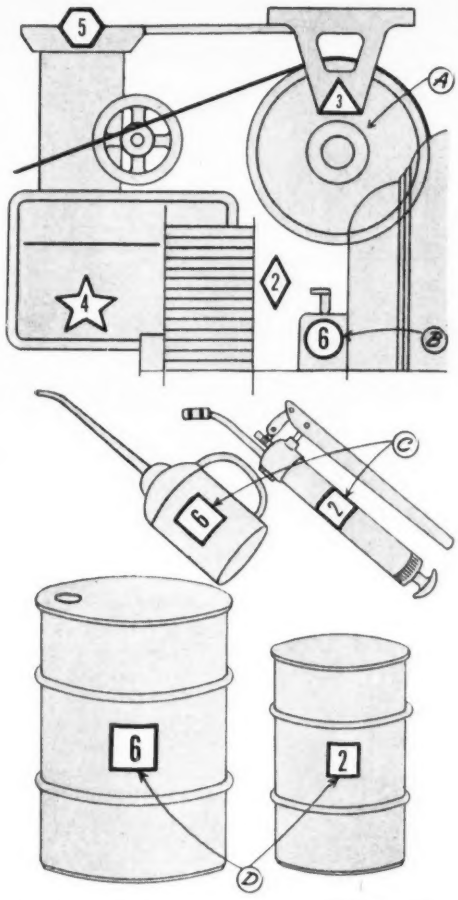
Spreadlite No. 6630 designed by Pressteel Co. is for commercial and residential use. It is available in 100, 150 and 300 watts. Heat resisting glass will stand exposure to weather and rapid temperature variation, according to the manufacturer. A shallow drop bowl glass permits wide-angle light distribution.

New Lamp Sizes (125)

A 75-watt R-30 spot lamp and a flood lamp of the same size have been announced by General Electric, for spaces too restricted for the R-40 and PAR-36 lamps.



Case 1102--Preventing Lubrication Mistakes in Plants and Motor Fleets



Many operators of plants and fleets in the West have practically eliminated operation delays due to improper lubrication or use of wrong lubricants, by installing Standard of California's free, coded system of planned lubrication. The system employs symbols instead of colors to indicate lubrication intervals -- stops mistakes caused by color-blindness, faded colors or changed appearance of color in different lights. Available for plants and fleets in the Seven Western States.

A. Black-on-white decalc symbols show desired lubrication intervals at a glance. Are placed directly on machine at lubrication points.

B. Numbers on the decalcs indicate the kind and grade lubricant to be used at each point. Chart card on each machine gives meanings of symbols and numbers.

C. Lubricant number-decalcs on dispensers identify lubricant in each dispenser and prevent its use in wrong place.

D. Lubricant number-decalcs on barrels, cans or other storage show kinds and grades of lubricant in stock.

All decalcs, chart cards and other material for the Standard Coded System of planned lubrication, and installation of the system are free. On request, a Standard Fuel and Lubricant Engineer from Standard Technical Service will survey your plant or other operation any place in the Seven Western States. He will make recommendations, give expert advice and install the Standard Coded System if you desire it.

Trademarks, "Calol," "RPM," Reg. U. S. Pat. Off.

STANDARD TECHNICAL SERVICE will make your maintenance job easier. If you have a lubrication or fuel problem, your Standard Fuel and Lubricant Engineer or Representative will gladly give you expert help; or write Standard of California, 225 Bush Street, San Francisco 20, California.

RPM CALOL

FOR EVERY NEED A **STANDARD OF CALIFORNIA** JOB-PROVED PRODUCT

Buy
YOUR GENERATOR AND MOTOR BRUSHES
from a
SINGLE SOURCE

HERE'S WHY

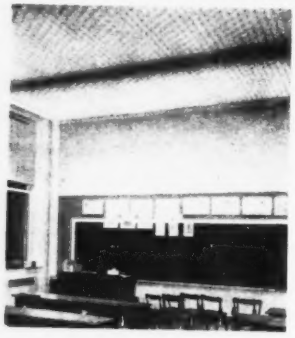
Our organization develops and manufactures brushes from the raw material to the finished product. Although we carry standard items in stock, we also maintain a complete engineering staff to assist you in the selection and application of correct brushes for your equipment. We base our 30 years of reputable existence upon our SERVICE to INDUSTRY. Try Ohio for your brush requirements.

West Coast Representative
C. F. BOWERS
544 S. San Pedro St., Los Angeles, Cal.

THE OHIO CARBON CO.
12508 BEREA ROAD
CLEVELAND 11, OHIO

Ceiling of Light (126)

Cell-Ceil, recently introduced by Federal Enterprises, is a prefabricated, louvered, all-steel material made up in honeycombed panels that fit together into a single continuous ceiling when hung below the lighting fixtures of an old ceiling. It is said to eliminate glare below an angle of 45° and to deliver a diffused, even illumination with either incandescent or fluorescent lighting, although fluorescent is recommended by the manufacturer. Panels come in 24- or 30-in. widths and in lengths varying by 6-in. steps from 96 to 12 in. Weight is 12 oz. per square foot.



F Luminaire (127)

F. W. Wakefield Brass Co. is offering the Sentinel, fluorescent luminaire for single mounting. It is a 4-ft. unit using four 40-watt lamps. It is similar to the continuously mounted Grenadier II and Grenadier IV and may be used with these. The light distribution pattern may be controlled by addition of either solid top-plate reflectors or slotted top-plate reflectors allowing 8% of the light upward, according to the manufacturer, who states that without top-plate reflector it has an over-all efficiency of 77.5%, with an upward component of 43% and a downward of 34.5%. Brightness readings on the louvers are said to show 0.9 candlepower per square inch, and on the luminous side panel, 1.2.

Street Lighting Unit (128)

A street lighting unit with built-in photoelectric control that responds to changes in the prevailing light level and turns the lamp on and off as conditions demand has been announced by G-E. The new Form 110 luminaire has a standard optical system and mountings; is designed especially for residential, suburban and traffic circle lighting.

For Dependable Soldered Connections

Sherman Soldering Lugs are clean, bright, and free from grease, inside and out. To prepare them for soldering, Sherman Lugs are tumbled in sawdust, given a special acid cleaning bath (bright finish) and then rigidly inspected. You get a perfect solder joint every time when you use these lugs. That's why it pays to specify Sherman!

Also:

Solderless Lugs • Splicing Sleeves • Split Bolt Connectors • Wedge Grip Connectors • Ground Clamps and Fittings • Armor Rod Clamps • Jumper Clamps

H. B. SHERMAN MFG. CO.
Battle Creek, Michigan

WRITE FOR
Sherman
CATALOG!

As you **MODERNIZE** *street and highway lighting –*

Standardize on **HUBBARD** *lighting hardware*

Your present street or highway lighting system can be matched—
or new fixtures to meet your exact requirements can be furnished from
HUBBARD stocks or from HUBBARD'S extensive engineering and
manufacturing facilities. And every HUBBARD product carries the extra
protection of hot double-dip Galvanizing for permanent rust resistance.
That's why it pays to call HUBBARD first for all street lighting hardware!
Distributed through Graybar Electric Company, Inc.,
and General Electric Supply Corporation.

HUBBARD AND COMPANY

PITTSBURGH OAKLAND, CALIFORNIA CHICAGO

HANG THE LOAD ON HUBBARD HARDWARE

The tube that has done most for television

has 95% NICHROME* V metal parts

THIS is the RCA Image Orthicon 5655—super-sensitive eye of the television camera and picture-getter extraordinary.

Only 15¼" long, the tube contains over 150 precision-made parts—which must not only be non-magnetic, but possess high resistance to heat and oxidation.

The alloy that most satisfactorily meets the manufacturer's exacting specifications is Nichrome V.

That is why 95% of the metal parts in the Image Orthicon 5655 are made of Nichrome V.

Driver-Harris manufactures more than 85 alloys for the Electronic and Electrical fields. These are distinguished for giving exceptionally efficient, long and economical service—not only in conventional applications, but most particularly where requirements are unusually tough. So send us your specifications. As with the Image Orthicon, it is most probable a D-H alloy will best serve your needs.

*Nichrome is manufactured only by

Driver-Harris Company

Stocked for the Coast Trade at: ANGUS-CAMPBELL, INC.
235-241 San Bruno Ave., San Francisco 449 So. San Pedro St., Los Angeles 2122-4th Ave., Seattle
Main Office and Plant: HARRISON, NEW JERSEY

*T.M. Reg. U. S. Pat. Off.

NO MORE "FIELD VARIATION" FOR YOUR MOTOR BRUSHES

WITH HELWIG CUSTOM-MADE BRUSHES —

- You get brushes precision-shaped at the factory.
- You pay no more.
- You save shutdown time required to cut down so-called "standard" brushes.

Call the Helwig office near you for complete information.

Get
U. S. Pat. 2,181,076
MULTIFLEX BRUSHES
for
• IMPROVED COMMUTATION
• MORE UNIFORM WEAR
• LOWER OPERATING COSTS
You get all three, thanks to MULTIFLEX Brushes' uninterrupted, better contact, reduced circulating current, even wear.

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Los Angeles	611 W. Pico Blvd.; Prospect 8381
Denver	1644 Blake St.; Cherry 4425
Salt Lake City	524 E. St.; Tel: 3-1600

HELWIG SPEER

HELWIG CO., Carbon Products
Makers of Multiflex and Transert Brushes

Surface-Mounted Unit (129)

The Leader Surface-Mounted unit is for two, three or four 40-watt lamps; may be used singly or in continuous runs. More than 90% of the light is down light; the upper member has a reflector that works with lens and refractor to eliminate ceiling shadows and light up ceilings.

Over-all F Fixture (130)

Leaderall louvered light ceiling is an over-all fluorescent lighting fixture of molded destaticized plastic. The ceiling is said to be rigid and level and units may be expanded endlessly. Tie-rods of various lengths are available so that the illuminated ceiling may be of any height below the structural ceiling to which the lamps are attached.

Louvered Light Fixture (131)

The new Gibson 6200-6400 louvered light fixture combines the company's No. 900 louver assembly with its No. 2400 2-light or No. 4400 4-light fixture. Present installations and inventories of 2400's and 4400's may be converted to the new unit, according to the announcement.

F Unit (132)

A new instant-start fluorescent unit featuring simplicity of design has been announced by Smoot-Holman. This unit, the Constellation, comes in satin aluminum and baked white enamel for single or continuous mounting; is 97¾ in. over-all length; takes the 96-in. T-8 cathode Slimline lamp. Shielding units will be available for attachment if desired.

X-Ray Film Illuminator (133)

Appleton Electric has redesigned its type EFUX explosion-proof X-ray film illuminator for flush mounting in hospital operating rooms. It is possible to install the metal cabinet flush in the wall, then mount fixture. Line wires are connected to the connection block located under screw cover in lower housing and all other wiring and sealing is completed at the factory.

Portable Flood (134)

The Hi-Lo Lite manufactured by Engineered Products Co. is a portable flood for use in photography. A low light is used while posing the subject and high-intensity lights are turned on to take the picture. This feature is accomplished by use of a DP,DT switch which, in low position, places the lamps in series and, in high position, puts them in parallel.

new machines build
new values into
new I-50 meter!

This semi-automatic multi-spindle drilling and tapping machine is one of the many pieces of new equipment designed especially for I-50 production—and designed to insure uniformity of the product. It has 11 heads that perform 27 operations simultaneously, and turn out a completed frame in each cycle.

In keeping with the introduction of the many new design features of the I-50 meter, we have provided new manufacturing facilities—fully equipped with all new machine tools and equipment—that represent the most modern methods and techniques available.

The accuracy and low maintenance costs of the I-50 are further assured by the technical skills that have gone into its various manufacturing steps. Specially trained personnel, precision manufacturing techniques, and rigid quality control are all part of the picture.

They are a vital means of preserving the exceptional qualities designed into this meter. The result is passed on to you in the form of greater sustained accuracy, longer life, and lower maintenance costs.

H L Ross

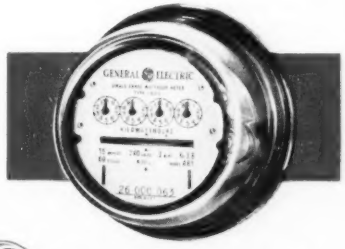
Manager of Manufacturing
Meter and Instrument Divisions
West Lynn, Massachusetts

Type I-50, the first completely new watthour meter in 50 years

Order now from your nearest G-E Representative. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

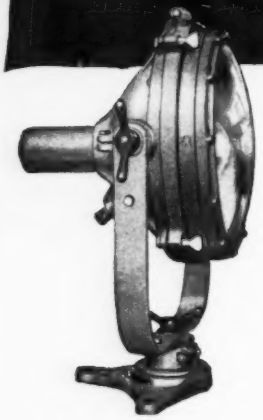
THESE FEATURES CAN SAVE YOU MONEY

1. Co-ordinated insulation — for better performance under adverse operating conditions.
2. Magnetically suspended rotating element — to do away with bearing maintenance.
3. Braking magnets die-cast in frame — to assure calibration stability.
4. Current coil molded in butyl rubber and potential coil in polyethylene — for greater insulation and stability.
5. One-piece molded "S" base — to minimize corrosion.



GENERAL ELECTRIC

DEPENDABLE
Floodlighting
WITH MINIMUM
MAINTENANCE



Pyle-National heavy duty floodlight equipment is built to withstand severe operating conditions; to provide the reliable lighting needed for protection, and for outdoor night work. Pyle-National reflector design and light control lenses assure high efficiency lighting with proper distribution for maximum usefulness. The wide range of types and sizes, from 100 watts to 2000 watts, allows individual requirements to be met easily and economically—substantial weatherproof construction with sealed interior gives maximum protection to reflector and lamp bulbs. Interior cleaning and other maintenance is greatly reduced. Write for Catalog 2100 giving full information, with beam efficiency, candlepower, and light distribution data.

THE PYLE-NATIONAL COMPANY
1364 N. Kostner Avenue, Chicago 51, Illinois

Pacific Coast Sales Office
25 Beale Street, San Francisco 6, Calif.

BULLETINS ETC.

Lighting Layout (135)

Edwin F. Guth is offering a lighting layout guide. It is made of plastic with die-cut shapes for drawing fluorescent and incandescent lighting fixtures. Cut-outs are provided for the more frequently used electrical symbols for wiring and switching details. An 8-in. ruler and 1/8- and 1/4-in. architectural scales are included.

Transformers (136)

Features of Allis-Chalmers substation transformers for rural and industrial service in ratings from 50 to 500 kva. are covered in an 8-page bulletin recently published.

Catalog Sections (137)

Locke has published two new catalog sections—one on switch and bus insulators; one on fittings for suspension insulators.

Power Factor (138)

"Power Factor and What to Do About It" is the title of a 20-page pocket-size bulletin offered by Electric Machinery Mfg. Co.

Relays (139)

Advance relays are described in a new illustrated catalog, which supersedes the January 1948, issue.

Oil Circuitt Breaker (140)

Pacific Electric Mfg. Corp.'s Catalog 510 describes type AKE outdoor frame-mounted oil circuit breaker. This breaker has motor-compressed-spring operating mechanism; is 7.2 kv., 600 amp., 50,000 interrupting kva.

Wires and Cables (141)

A 44-page catalog on Rome bare and Weatherproof wires and cables contains tabular and technical data; includes American Standards specifications for weatherproof wire type URC.

Valves and Gates (142)

An 8-page booklet describing values and gates for hydraulic equipment has been published by Westinghouse.

Freezer (143)

Acme-National Refrigeration Co. is offering a data sheet on its 1949 Freeze-O-Matic.

Troffer Lighting (144)

Miller has issued a revised edition of its "Ceilings Unlimited," describing the company's fluorescent troffer lighting systems. The booklet is illustrated, contains 105 pages.

Specification Booklet (145)

RLM Standards is offering a specification booklet of standards established as a guide to the buyer of lighting units for industrial use.

Wire Catalog (146)

United States Rubber Co. is offering a 20-page catalog of its line of latex insulated building wires and cables.

ELECTRICAL WEST, 68 Post St., San Francisco 4, California
Please send me information about following CIRCLED items:

100	101	102	103	104	105	106	107	108
109	110	111	112	113	114	115	116	117
118	119	120	121	122	123	124	125	126
127	128	129	130	131	132	133	134	135
136	137	138	139	140	141	142	143	145
146								

Name ..... Company* ..... Title* .....

Address .....

* Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

it's new

RoLene Polyethylene Covered

WEATHERPROOF WIRE

LONGER LIFE
MOISTURE RESISTANT
LIGHTER WEIGHT
SMALLER DIAMETER
ABRASION RESISTANT
RESISTANT TO SUNLIGHT AND WEATHERING
SIMPLE TO HANDLE AND INSTALL

Summed up for you, above, are the outstanding features of RoLene, Rome's new polyethylene covered Weatherproof wire. There are no braids to rot and festoon. Because of reduced wall thickness . . . 3/64" on sizes 12 AWG to 4 AWG . . . and the lower specific gravity of polyethylene, overall weights and diameters of RoLene are less than conventional Weatherproof. This means longer spans of RoLene for the same loading conditions . . . longer life . . . neater appearance . . . easier handling.

Rome RoLene Weatherproof wire is manufactured in sizes 12 AWG through 4 AWG with solid conductors, and in sizes 2 AWG and 1 AWG with stranded conductors. Conductors can be soft, medium hard drawn, or hard drawn as specified.

FOR CONSTRUCTION DETAILS WRITE FOR SPECIFICATION WP-3.

FROM BAR TO FINISHED WIRE

ROME CABLE CORPORATION

ROME • NEW YORK

PACIFIC COAST SALES OFFICES

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LOS ANGELES 21, CALIF.
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3401 Fourth Ave., So.

ELECTRA'S HUSBAND

LITTLE BUSINESS —AND BIG TOO

"SOMEDAY," Electra's tone of voice had a bite to it, "Someday I hope *somebody* runs a street car and bus system like a private business and not a public utility."

"But, my dear, the transit system here *is* privately owned."

"You'd never suspect it," barked Electra.

"Just what do you mean then?"

"I mean that somebody will wake up to himself—"

"Who?"

"Oh the manager or the president or whoever it is that runs one of those things. Someday he'll try to *serve* his customers, try to give them a *better ride*, with *lots* of seats and no traffic worries. He'll *sell* people on *preferring* to ride on his trains and buses because they are comfortable, because they give frequent service and courteous, humane treatment."

"You mean, my dear, that he'll have to provide those things first, before he can sell them."

"Naturally. But he'll try to make us *like* doing business with his darn ol' buses and street cars instead of trying to make us mad at the whole caboodle."

"You are dreaming of heaven, aren't you?"

That made Electra madder. "I am *not*. Is it too much to expect of a business that it be run like a *business* instead of a public utility or a public office—like that assessor's we have to take insults from every year? Streetcars are in business aren't they? Don't they want any more business? Why do they drive us all to using our own cars in preference to saving money and riding with them? We'd rather take a beating from the traffic than from a grumpy conductor or bus driver who doesn't give a darn whether we ride with them or not? At least in our own cars we can maintain our self respect."

"You've got something there," I had to admit. "Of course it would cost more, and I suspect they are trying hard to operate on a ten-cent fare, which doesn't leave them any margin to add more buses, train the help better, and advertise for customers. Being a public utility, they can't charge what they want in order to finance better service, you know."

"But who's fault is that?" Electra wasn't to be silenced. "If they hadn't been so stingy with service and so greedy for revenue in the first place, the public never would have had to regulate them."

"Yes, yes, that's true, but it is also water over the dam. They *are* under all this regulation now."

"Has any of them ever *tried* to run it like a competitive business? Has any of them ever come forth with a proposition to give us all *real* service—oh yes I know, just before asking for a rate increase they are as nice as pie—but what I mean is, has any company like that ever figured it was in competition with every person's own automobile? Has it approached it from that point of view?

"If it had, it would see where it could offer nice comfortable street cars and buses, and lots of them. What if they aren't full? Who wants to stand up in a bus or street car, ever? They don't have to in their own car do they?

"Instead of abandoning lines, why aren't they looking out for ways to extend and improve them, to make it less and less necessary to use the family car? Certainly there never was a time when everything was as much in their favor as it is becoming now. You can't park anywhere. If you do, it costs five times as much for parking alone as it does for bus fare, let alone gas and oil and stuff. So that ought to give them a lot of room to get more for their rides and give better service."

"Yes," I had to admit. "Even I hate to drive the car in town nowadays."

With that I began to catch the idea too, and added. "Yes, it ought to be tried. If their employees felt they were in competition and were given a bit of sales inspiration—"

"You call it sales inspiration, but I'd call it just common courtesy."

"Sales point of view would do more than anything else to promote courtesy. It puts incentive into it. If the employees realized they were in stiff competition for business with each man's own auto, they would learn the reasons why their ride was worth patronizing and courtesy would be one of those reasons. So they would want to make it true."

All this little repartee was over the transit system, but the same thing applies to big and little utilities, big and little companies, I thought. Why should any *business* be run like a public utility when it can be run like a *business* instead? If it is in business it has something to sell, some service to perform. Whether it has a so-called monopoly or not, that is only relative, for, no matter what the business or service, it has competition. Either it competes with other similar businesses, or against other services that can be used instead, or, if nothing else, for its share of the consumer's dollar.

All too often management looks down the wrong end of the telescope. It tries to reduce costs so much that it reduces service and gradually reduces any reason for its existence that may be left. The street car systems are a prime example of a business that has cut and cheapened itself out of existence. The private auto has been a terrific competitor, but the time approaches when the automobile will have reached saturation. In cities already that point has been passed and the advantages of owning a car are closely balanced by the disadvantages. What a chance for live competition and salesmanship!

Ownership has little or nothing to do with it—if it is a *business*.

Any electrical business that wants to *remain* in business looks toward *increases* in and *improvement* of service. People do not gripe at the cost, if they feel they get their money's worth. Electra hit the target. We should all act as if we *wanted* to have her business. I suspect of late many of us haven't.

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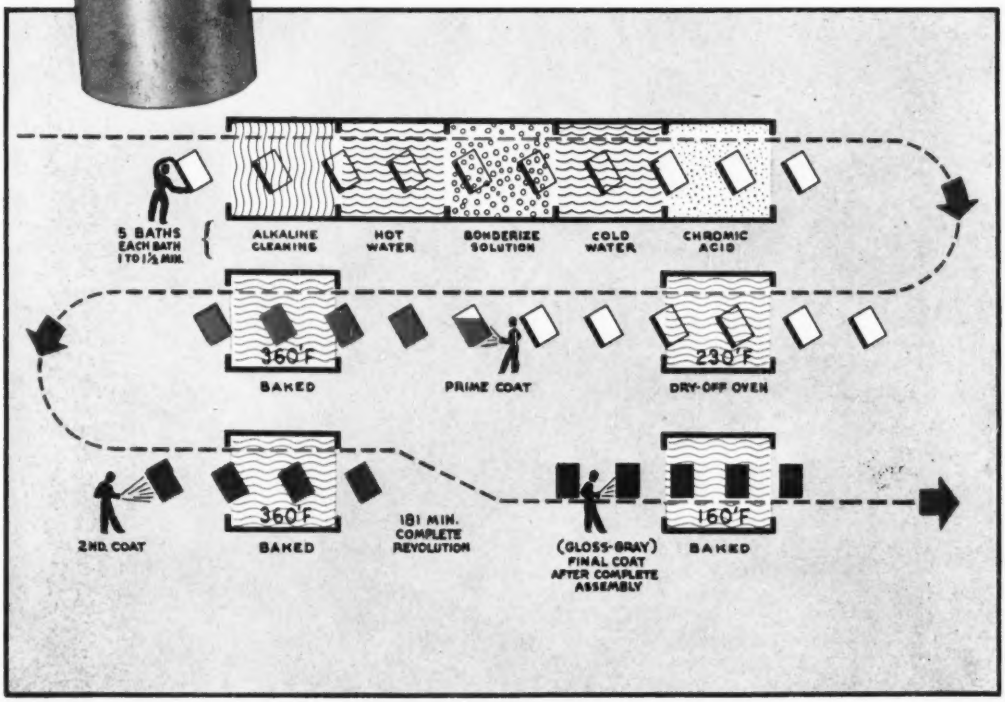

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What GLAZON (TRADE MARK) is:

"Glazon" is the trade name registered by Triangle Conduit & Cable Company to identify its recently perfected type of protective outer covering. The exceptional degrees of flexibility, smoothness and durability shown by "Glazon" covering stem from many factors, including:

Braid based on an inorganic substance derived from glass which cannot rot, burn, absorb moisture, or deteriorate with age.

Saturant developed specifically for the braid. Bonds permanently to the individual fibers and sets new standards for resistance to heat, moisture, fire and rot.

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Boston, Mass., 470 Atlantic Ave.
Charlotte, N. C., 210 Builders' Bldg.
Chicago 6, Ill., 20 N. Wacker Dr.
Columbus 8, Ohio, 1356 W. Seventh Ave.
Detroit 2, Mich., 914 Stephenson Bldg.
Houston, Texas, 4101 San Jacinto St.
Indianapolis, Ind., R. R. #5—Box 555
Kansas City 8, Mo., 1827 Grand Ave.
Los Angeles 13, Calif., 923 E. Third St.
Minneapolis 4, Minn., 1419 Second Ave., S.
New Orleans, La., 348 Baronne St.
New York 7, N. Y., 50 Church St.
Newark 2, N. J., 189 Market St.
Palm Beach, Fla., 244 S. County Rd.
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JANUARY, 1949 Vol. 102, No. 1

ELECTRICAL WEST

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED SECTION OF THE U. S.

What Makes it Tick?

For years now the way the electrical industry in San Diego works together and **sells** its head off has been a wonder to others. Just what is back of it, people ask. A lot of things—some 350 members of the most active electrical league in the West are back of it—100%. But to make such a league as the Bureau of Radio and Electrical Appliances possible takes a broad-gage utility company philosophy of industry cooperation. Modestly, the author of this talk, given at the last convention of the National Electrical Wholesalers Assn., Pacific Zone, at Coronado, Oct. 4-6, 1948, has kept himself in the background. His company has played a **very** important part in the San Diego organization, but never a **dominating** one. Rather it has always been a willing cooperator in an **industry** undertaking. It has done its share gladly and yet never sought to be more than a good active member. It is the philosophy expressed here simply and directly by the commercial vice-president of San Diego Gas & Electric Co., "Doc" Holloway, that is back of such a policy of operation and participation. As a result the **industry** is the thing—the company is just a member of it. That industry, active, enterprising and alert, has become the strongest civic force in San Diego county. Such a philosophy provides a worthwhile pattern for such needed similar industry cooperative groups elsewhere.

Selling is an *Industry* Job

A. E. Holloway *

Vice-president,
San Diego Gas & Electric Co.

COOPERATIVE promotion of electrical merchandise, and in particular domestic electrical appliances, is a subject you and I have been interested in for more than 30 years. Personally I have always believed that the promotion of and the sale of the electric service and equipment by the public utility not only builds business for that company, but is its best plan for building and keeping good public relations. We all like to know that the company from whom we buy our electric service appreciates our business and desires to increase our purchases.

As soon as a utility stops its promotion then it stops its forward progress. As soon as its progress stops its public relations degenerates. No one likes a company that just hands out what you order.

But the utility cannot do all the promotion. It must have the assistance of the manufacturer, the wholesaler and the dealer. If an organization composed of these four branches can be formed, then a much better program can be planned and operated.

In San Diego I believe we have one of the most effective organizations in existence throughout the United States by which to carry on the promotional program for the electrical industry in this county. Many of you are familiar with this organization — The Bureau of Radio & Electrical Appliances of San Diego County.

In the beginning the public utility was the main source of promotional effort. This promotion consisted of the introduction of new appliances to the public as well as the demonstration of their use. Some manufacturers of appliances were also helpful and active in demonstration. Because the public was rather skeptical of the value of this new equipment, the main burden of promotion fell on the shoulders of the utility's sales department.

I can well remember the problems of creating public acceptance. In 1910 I personally attempted to secure public acceptance of the electrical flatiron in San Diego. In those days we went from door to door offering to leave a flatiron on a month's trial. At the end of the month I would call back and, if the customer purchased it, I would make a contract whereby the iron could be purchased on the light bill by paying $1 with the contract and $1 a month for six months.

The acceptance of this plan was about one iron in ten calls to start with, or about two irons per day sold. By 1912 we had three men in the field and paid them $1 per iron placed. These men, if they were good, could average about four irons per day per man.

The same was true with the intro-

* Presented at the Pacific Zone Convention of National Electrical Wholesalers Assn. at Coronado, Oct. 4-6, 1948.

duction of the electric toaster, the coffee percolator, later the electric range and refrigerator, and all through the list of appliances that are so common and accepted today. It was a struggle to get the public to believe in them. Today, however, many of these items have a saturation of from 80% to 100%.

This struggle for public acceptance caused many of the utilities to go directly into the appliance business and to deal directly between the manufacturer and the customer. Thereby they by-passed the distributor and the dealer.

We in San Diego attempted several times during the period from 1910 to 1930 to form a cooperative dealer organization. We went completely out of the appliance business twice during that period, only to re-enter the business more vigorously each time. The reason for these unsuccessful attempts to organize lay in the fact that the industry had not thoroughly determined the obligation of each branch in the promotion problem.

The electrical contractors in those days tried to hog all the appliance business and were jealous of the department store, the wholesaler and the utility. It was almost impossible to form an organization for cooperative promotion because it soon turned into a price and trade-fixing group and fell apart of its own weight.

Finally the distributor began to find his place in this promotion plan and the cooperation of the distributor with the manufacturer and the utility began to lay the basis for a sound organization for the promotion of electrical appliances.

The Bureau of Radio & Electrical Appliances of San Diego was organized in September 1930. A meeting of the utility and five of the active distributors of appliances in San Diego County launched it. At this meeting the activities of the bureau were outlined and the responsibility of each branch in the promotional effort was determined.

Let me state right here that we had great assistance from the distributors in starting this organization. One of them agreed to pay $50 per month, one $40 and four $25 per month, in addition to the amount the utility would give. The utility matched the total and we were able to hire a man to manage the organization.

We were lucky in selecting an energetic manager, one who had understanding of the industry and who could secure the confidence of the dealers and distributors. He is J. Clark Chamberlain, whom you all know, and who is the man that has led this bureau through the 18 years of its existence, and who has built the organization up to its high efficiency of today.

HOME FREEZER SALES
FOR SAN DIEGO

1946 NO COOPERATIVE ADVERTISING **650**
1947 6TH COOPERATIVE ADVERTISING **2845**
1948 first 8 months **2915**

From the standpoint of the utility I want to say that *the solid work accomplished by this organization in our territory has been the main reason for our company's getting out of the appliance business and depending on this organization for the promotion of our domestic business.* I also want to state that the assistance and cooperation given by the electric distributors to our bureau is making it a real success.

The promotion of home appliances must be a continuous and a complete effort by all of those interested, at all times. We are now reaping the harvest resulting from the work done by our bureau in the 18 years of its existence. *We will continue to reap this harvest as long as we continue to sow. However once you quit sowing, then your crop soon stops.*

Our Bureau of Radio & Electrical Appliances now has 350 members who pay dues ranging from $12 to $60 per year. A schedule is arranged so that the smallest dealer can afford to become a member. Anyone who manufactures, distributes or sells at retail electric appliances is welcomed as a member. The reason for this is that we want the cooperation and assistance of everyone in this effort.

The purposes of the bureau are strictly promotional and educational. It is understood by all the members that the bureau shall not be used for any other purpose.

Our utility authorizes a large budget to be used by the bureau for advertising and promotion. This advertising is carried over the bureau's signature rather than that of the utility. In fact, about 70% of the company's electrical promotional advertising budget is handled in this way and, in general, only the public relations advertising of the company, together with new ideas which the company desires to promote and which are not generally handled by bureau members, is done over the company's signature. This gives prestige to the bureau and, after all, accomplishes what we all desire, the general promotion of electricity through electrical appliances and equipment over adequate wiring.

We also authorize quite a sum in addition for the operation of the bureau and its staff. The promotional advertising of the bureau is controlled by an advertising committee of 15 members appointed by the president of the bureau and the board of directors. This advertising budget is distributed to campaigns to be run each month. The program and the schedule is made available to members for a full six months in advance so that everyone can cooperate in making the campaigns successful.

The directors of the bureau, 30 in number, are nominated by a committee consisting of five immediate past presidents and voted on by ballot in August each year. I want to say here and now that *the directors of this bureau really work and run this organization.* The attendance at the board meetings averages more than 90%. Where you have that kind of interest and attention you can be sure you get something done.

The bureau is also divided into certain divisions. These are the electrical contractors division, the electronics division, the gas merchandising division, each of which is represented by a member on the board of directors. Each such board member becomes the chairman of the division.

The electrical contractors division has as its main objective the adequate wiring program for which the bureau is the official certification agency in this territory. The electronics division has for its main objective the training of radio and television service personnel and informing them of the technical developments of radio.

Each year the bureau holds two inspirational meetings, one in the spring and one in the fall. These meetings last for one day only and men important in the industry and related business are obtained to give inspirational and informational talks.

The bureau usually holds two electrical shows each year, one in the spring and one in the fall. Over a five-

day period the attendance at these shows runs from 120,000 to 150,000 persons. We just recently completed a very successful show in Balboa Park.

The many things this bureau accomplishes for this industry are too numerous to mention. Included are such things as training schools for salesmen, training schools for technicians, training schools for management, mass promotions, public demonstrations, news publicity, promotional campaigns, information service on government regulations, etc. during the war.

Our company depends on this bureau to keep the electric equipment before the public eye and to keep alive interest in the purchase and use of this equipment by the public. It is my humble opinion that it is the most effective method available to the electric industry for furnishing mass promotional effort to the sale and use of domestic electric appliances.

Our bureau has been most successful in the introduction of new appliances for public acceptance. Take, for example, the campaign to popularize the home freezer which was adopted over a year ago throughout our territory. First all of our dealers and distributors were schooled in the selling story of the home freezer so that they knew what its advantages were and how to sell them. Then public demonstrations were conducted in the school auditoriums throughout the country. Advertising campaigns, newspaper articles, farm bureau meetings, radio announcements, billboard advertisements, street car cards, store displays and demonstrations were used. The result? San Diego has shown the largest sales of freezers per thousand domestic customers of any place in the country. The bureau has received recognition from many parts of the nation for the job done.

To summarize this discussion let me give my ideas in reference to mass sales promotion.

First it is my belief that each branch of the industry has a job to do.

The manufacturer of equipment must:

1. Advertise nationally in all the national magazines and over the radio to popularize his equipment and to obtain public acceptance locally.

The distributor must:

1. Advertise in the local territory to popularize and to obtain public acceptance locally.

2. He must also appoint and train dealer representatives in the territory.

3. He must familiarize these salesmen with the essential selling points of his equipment.

4. He must arrange for a local service outlet for all his appliances.

5. After this he must help his dealers with public demonstrations and other sales helps.

6. He should also help his dealers organize and train an efficient sales force.

The dealer must:

1. Cooperate by tying-in with all the campaigns.

2. Keep his sales force on its feet.

3. Advertise his store and the equipment for sale therein.

4. Make his store attractive to the public so that it will come there for information.

The utility should:

1. Assist the manufacturer, the distributor and the dealer by keeping an organization of the four groups going in such a manner as to secure the mass benefits from all the work done by all branches of the industry.

I think we are doing this in San Diego through our Bureau of Radio & Electrical Appliances. It should work in any other territory in which the same philosophy obtains and the same principles and efforts are applied.

Economics of Large Power Transformers

W. G. Hart
General Electric Co., Los Angeles

Use of three-phase transformers instead of single-phase units, forced cooling, and reduced insulation levels are three means available to the user for reducing costs of large power transformers

A TREND toward the greater acceptance of the more economical types of large power transformers is indicated by recent articles in the technical press. It is felt that an elaboration of this discussion, particularly for the higher voltage classes,* would be of special interest to Western readers. Three economic consideratons by means of which the cost of large power transformer installations can be reduced substantially, will be discussed. Each of these three considerations makes possible reductions in both the active and inactive material content, as well as the labor content of large power transformers and, as a result, a reduction of transformer price. Each of these three considerations, admittedly, will make the transformer installation less "gold plated." However, rising costs coupled with the realization of greater transformer reliability have brought about the acceptance by many users of one or all three of these economic considerations. These three economic considerations, which bring dollar savings in large power transformer investment, are:

1. The use of one 3-phase transformer instead of three single-phase units or instead of four single-phase transformers (the fourth standing by as a spare).

2. The use of improved, submarine-type oil pumps and high-velocity fan-cooled oil to air heat exchanger. Forced-oil cooling with high-velocity fan-cooled oil to air heat exchangers makes possible much higher current densities in the windings with resultant reduction in the material content of the transformer. This can be as much as 40% compared to self-cooled units.

3. Reduction of the insulation level of the entire high-voltage winding one level below the circuit voltage. This reduction in insulation means a marked saving in price. The reduction in insulation can only be accomplished on solidly grounded wye-connected circuits and with modern station-type lightning arresters properly applied and located reasonably close to the transformer. More and more transformers for circuits of 138 kv. and

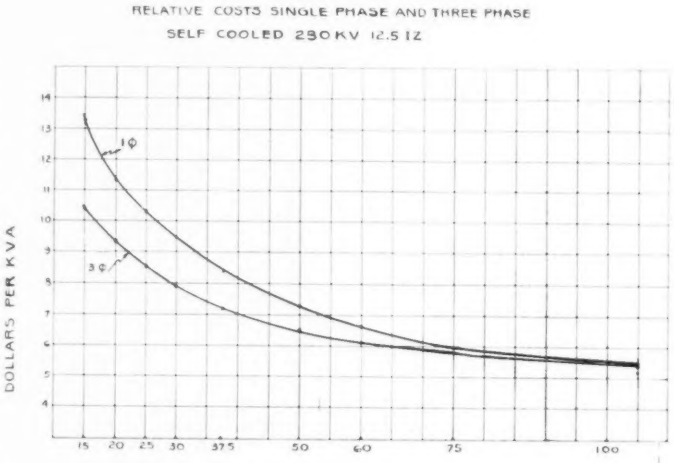


Fig. 1

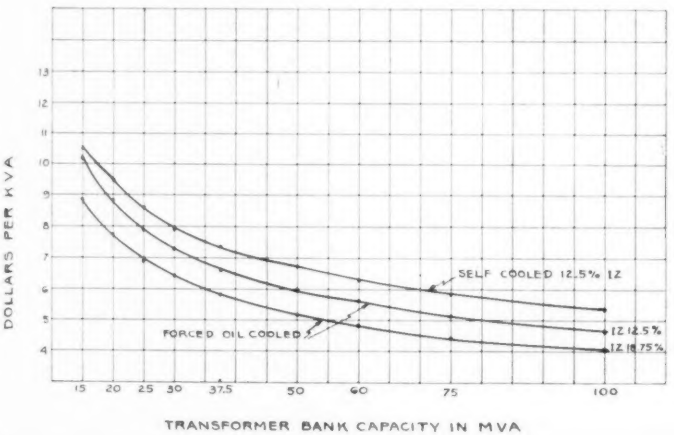


Fig. 2

*Only the 230-kv. voltage class is considered. Approximately the same savings and cost trends exist for the lower voltage classes.

50,000-kva. Transformer Bank 230 kv. to 69 kv.

Type and Impedance		Initial Investment	Dollars saved compared to Type 1	% Saved compared to Type 1
Self cooled single phase full insulation 12.5% IZ	1	$370,000	.....	.....
Self cooled three phase full insulation 12.5% IZ	2	$330,000	$ 40,000	10.8%
Forced-oil cooled three phase full insulation 12.5% IZ	3	$303,000	$ 67,000	18.3%
Same as 3 but 18.75% IZ	4	$260,000	$110,000	29.8%
Forced-oil cooled three phase 196 kv insulation 12.5% IZ	5	$240,000	$130,000	35.2%
Same as 5 but 18.75% IZ	6	$215,000	$155,000	41.9%

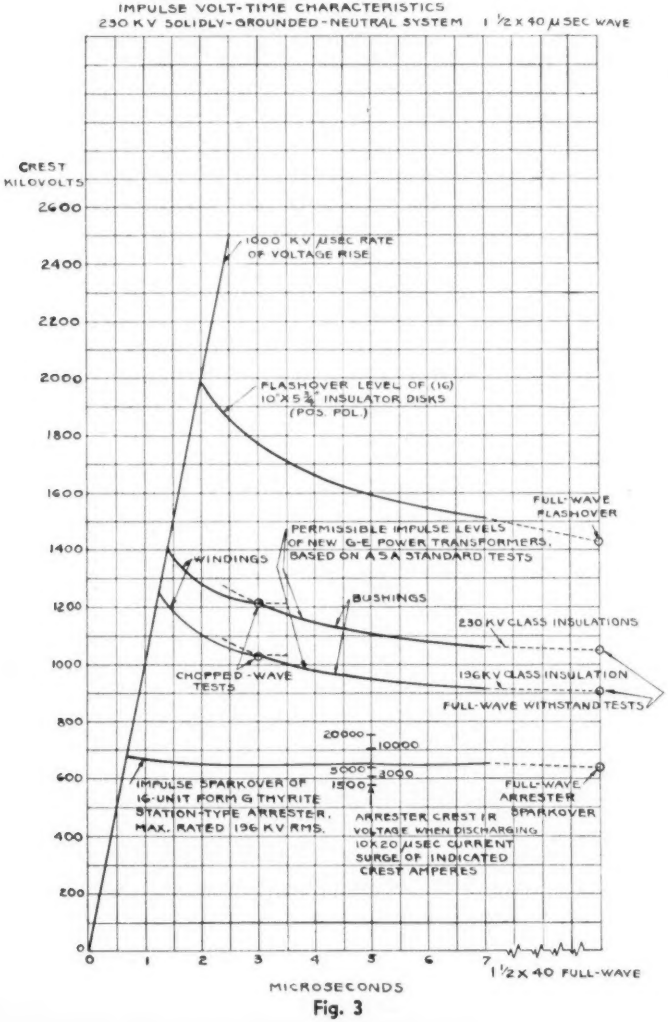


Fig. 3

above are being built with reduced high-voltage winding insulation.

Considerations Analyzed

1. Three phase versus single phase.

Fig. 1 shows dollars per kva. versus power transformer bank capacity in mva. for single-phase and 3-phase 230-kv. to 69-kv. banks. It will be noted that the saving varies from 30% and decreases as transformer size increases. (If the price of one 3-phase unit is to be compared with the price of four single-phase transformers, the saving as shown in Fig. 1 between three phase and single phase should be increased in all cases 33⅓%.)

2. Three phase forced-oil cooled versus three phase self cooled.

Forced-oil cooling brings a reduction in weight, size and core loss, but brings an increase in total loss and in impedance. The following shows in tabular form a comparison of these factors:

	Three-Phase Self-Cooled	Three-Phase Forced-Oil-Cooled
Floor area	100%	70%
Weight	100%	75%
Core loss	100%	80%
Total loss	100%	150%
Impedance	100%	150%

It is possible, at increased cost, to build forced-oil-cooled transformers with total loss and impedance approaching that of the normal values of self-cooled transformers. Fig. 2 is a plot of dollars per kva. versus transformer bank capacity in mva. for three cases: three phase self cooled with the normal impedance of 12.5%; three phase forced-oil cooled with the normal impedance of 18.75%; and three phase forced-oil cooled with 12.5% impedance. Costs per kva. for forced-oil-cooled units with impedance values between 12.5% and the 18.75% values may be interpolated directly.

3. Full insulation of high-voltage winding versus reduction of insulation of high-voltage winding to next lower voltage class.

Fig. 3 demonstrates the manner in which the insulation level of the high-voltage winding may be reduced one class while still maintaining an adequate margin of impulse protection by means of the modern station-type arrester. Fig. 3 plots impulse voltage values in crest kilovolts versus microseconds. As can be seen, even under severe discharge of 10,000 amp. (which would rarely be exceeded if the station and first half mile of outgoing lines have effective direct-stroke shielding), the lightning arrester limits the impulse stresses to about 67% of the full-wave demonstrable impulse withstand test level of the transformer in-

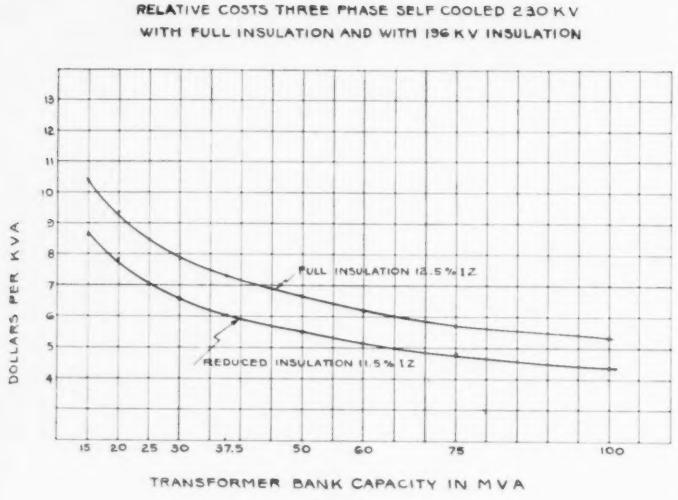

RELATIVE COSTS THREE PHASE SELF COOLED 230 KV
WITH FULL INSULATION AND WITH 196 KV INSULATION
FULL INSULATION 12.5 % IZ
REDUCED INSULATION 11.5 % IZ
DOLLARS PER KVA
TRANSFORMER BANK CAPACITY IN MVA

Fig. 4

sulated for 220 kv. If the transformer is insulated for 196 kv., the arrester limits the impulse stresses to about 78% of the full-wave demonstrable impulse withstand test level.

Fig. 4 is a plot of dollars per kva. versus transformer bank capacity in mva. for three phase, self cooled with 230-kv. insulation and with 196-kv. insulation. It will be noted that the percentage saving in installed cost realized is of the order of 20%.

To summarize the above and to show what over-all savings can be realized if all three of the considerations are adopted, Fig. 5 combines the preceding curves for 230 kv. to 69 kv. Shown are dollars per kva. versus transformer bank capacity in mva. for (1) single phase, self cooled, full insulation; (2) three phase, self cooled, full insulation; (3) three phase, forced-oil cooled, full insulation; and (4) three phase, forced-oil cooled, 196-kv. insulation. The shaded areas of curves (3) and (4) show the spread in cost for impedance values between the normal self-cooled impedance values and the normal forced-oil-cooled impedance values.

As an example, relative prices of a 50,000-kva. bank, 230 kv. to 69 kv. are compared for each of the types considered in Fig. 5 in the table on page 57.

In conclusion, it has been shown that substantial reductions in power transformer installed costs may be realized by making use of the improved and more economical types. In the final analysis, of course, how far the user can go toward accepting all of the features resulting in lower prices depends on a careful analysis of reduction in price as compared to increased losses and other factors. As indicated, a great number of users are finding it to their advantage to buy large power transformers incorporating one, two or all three of the features discussed in this article.

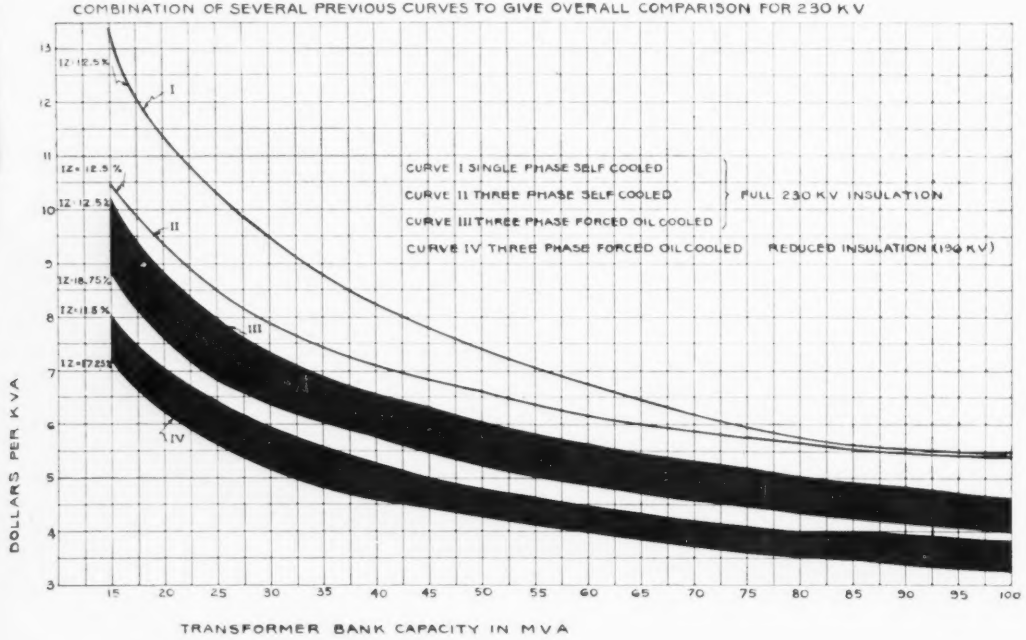
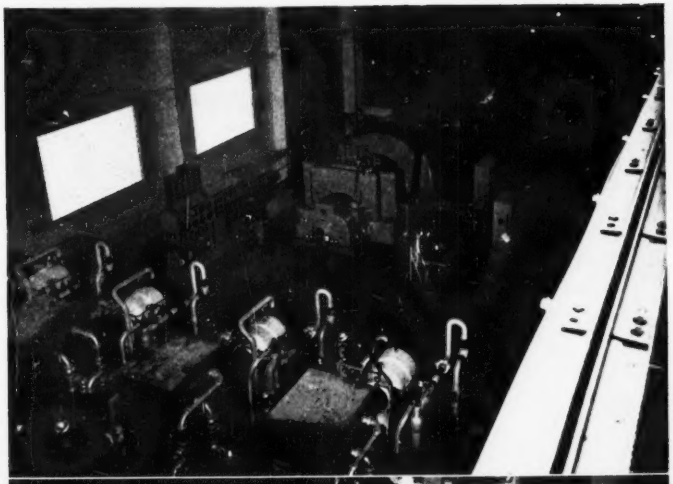
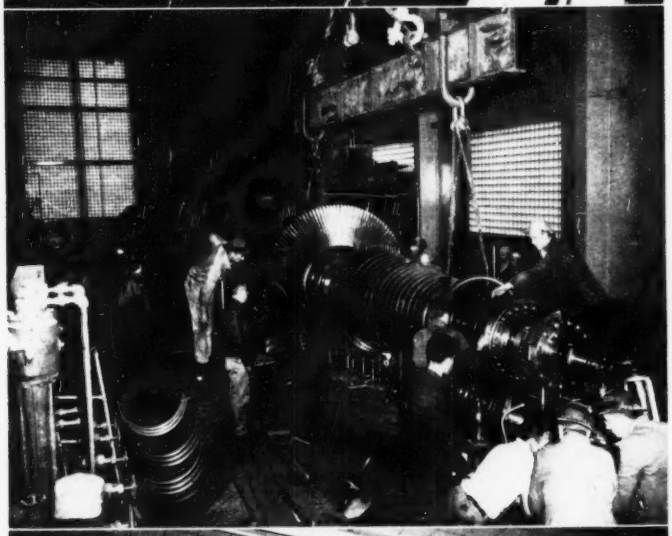
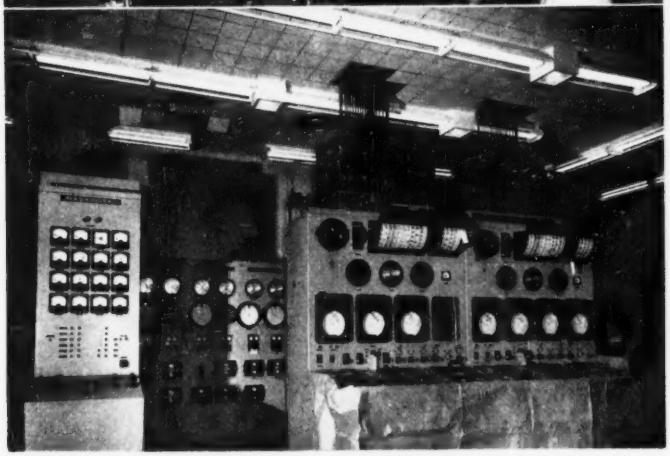

COMBINATION OF SEVERAL PREVIOUS CURVES TO GIVE OVERALL COMPARISON FOR 230 KV
CURVE I SINGLE PHASE SELF COOLED
CURVE II THREE PHASE SELF COOLED
CURVE III THREE PHASE FORCED OIL COOLED
CURVE IV THREE PHASE FORCED OIL COOLED
FULL 230 KV INSULATION
REDUCED INSULATION (196 KV)
DOLLARS PER KVA
TRANSFORMER BANK CAPACITY IN MVA

Fig. 5







Another 100,000 Kw. In Steam

for PG and E at Station P

FIRST of two 100,000-kw. units in Pacific Gas and Electric Co.'s new Station P steam plant at Hunter's Point in San Francisco went on the line on Dec. 14, 1948, in time to be of service in helping to carry the December peak. A second similar unit completing the plant is expected to be in service late in January 1949.

The two machines, furnished by General Electric Co., are rated 100,000 kw., 3,600 r.p.m., hydrogen cooled (15 lb.), 1,300 psig, 950°. Steam is furnished by four 475,000-lb.-per-hour Babcock & Wilcox boilers installed by C. C. Moore & Co.

In design, and particularly as regards centralized automatic control, the plant is very similar to Kern steam plant described in ELECTRICAL WEST for October 1948, p. 79. Operating manpower is expected to be only 50 to 60% that of a conventional plant.

All necessary operating controls—steam, mechanical and electrical—are grouped in a control center. Again like Kern, the plant is laid out so that operating personnel in the control center may look in one direction down the boiler firing aisle and in the opposite direction, into the turbine room.

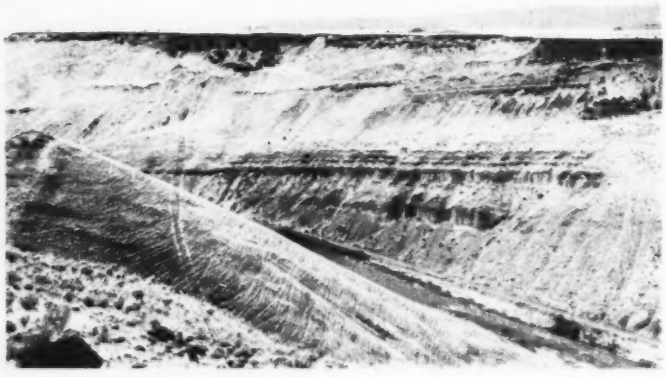
Output of the plant is fed into the PG and E system through three 110-kv. gas-filled cables. Two run to Martin transmission receiving substation in the southern part of the city and two go to new Mission distributing substation in the heart of San Francisco. Stone & Webster Engineering Corp. was designer and erector for Station P.

First of two 100,000-kw. steam units (upper) goes into service at PG and E's Station P San Francisco steam plant

Spindle for second 100,000-kw. unit (center) being carefully lowered into place by manufacturer's erection crew

Master control board (lower). Electrical section at left; steam section on right. Steam reduction board in rear

EASTERN OREGON 66-kv. TIE BUILT



COMPLETION of a 60-mile, 66-kv. transmission line through the rugged Deschutes River Valley in central Oregon in just over 150 days, is a construction record achieved by the Pacific Power & Light Co. The new line, built at a cost of $900,000, ties in the company's formerly isolated central Oregon system with its main system lying along the Columbia River Valley to the north. Hydro and steam resources of the central system had been outgrown in the brisk upsurge of the pine lumber industry in the Deschutes area during and after the war. Quickest and most feasible way to provide additional capacity in time for the 1948-49 winter peak was to tie the two systems together, giving the area a connection with the interconnected lines of the Northwest Power Pool. Under an agreement with the Bonneville Power Administration, the 42-mile center section of the line was built to 230-kv. standards and may be taken over by the government if it is

Difficulties beset construction crews from start to finish on Pacific Power & Light Co.'s rush transmission job to get more power into central Oregon. Spring thaws and mud, excessive summer heat, floods, strikes and rugged terrain—all failed to daunt construction forces. When going was too tough for tractors, poles and equipment had to be man-handled. Bakeover Canyon, opposite top, and Deschutes Canyon, opposite center, were two of the roughest spots. Machine digging was the exception rather than the rule. Despite all, 60 miles of 66-kv. line was completed in the short time of 150 days, equal to a mile every 2½ days

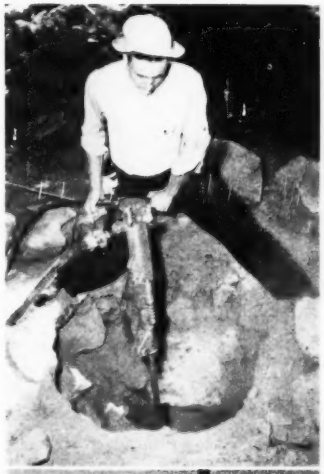
needed in any future development of the transmission network connecting federal dams in the Northwest. This would avoid needless duplication of facilities.

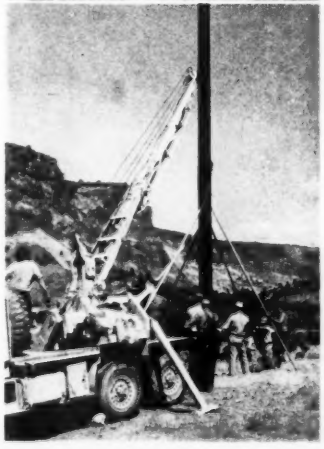
At its southern end the line connects with the company's Cove hydroelectric plant deep in the gorge of the Crooked River; on the north it ties in with the Tygh Valley hydro plant on the White River about 25 miles south of the Columbia. Use of the full capacity of the line awaits completion of reconstruction work on a 66-kv. line from Tygh Valley to The Dalles where a new $250,000 substation has just been completed as a system interconnection with the Bonneville system.

Terrain traversed by the new line was a nightmare to the line builder. It is largely high desert slashed and gullied with sharply hewn canyons. Underlying rock and hardpan made it necessary to hand dig a good part of the holes. The line negotiates four major canyons. It starts by scaling the sheer wall of the Crooked River gorge. Next it jumps tortured hills cut by Trout Creek. Farther north is the Bakeoven Creek crossing. Major crossing is a 3,500-ft. span over the 840-ft. canyon of the Deschutes.

Construction is of the H-frame type with prevailing span of 650 ft. On the section designed for eventual 230-kv. operation, poles are principally 65 and 70 ft.; on the Tygh Valley-Bakeoven section (66 kv.) they are chiefly 60 ft.; on the Madras-Maupin 66-kv. section, 55 ft. Conductor used was Type F Copperweld, 2/0 copper equivalent, with tensile strength of 8,094 lb. For the Deschutes crossing the same type and size of conductor was used except that tensile strength is 17,600 lb. Crossarms on the 230-kv. section are 36 ft. long. They consist of two 4x10 or 4x12 timbers to each crossarm assembly, blocked for future 230-kv. stringing, one with Z-plate for present 66-kv. mounting. Ground wires were used only on a half-mile section just outside Bakeoven as protection for a future transformer installation.

In the 42-mile section designed for 230 kv., there are only three angles. Conductor in this section eventually will be 795,000 cir. mil. ACSR. Present copper circuits are so arranged on the structures that they can be replaced with the new conductors with the line in operation. The line is also featured by heavy anchoring, using 12-in. channel anchors in both 4-ft. and 6-ft. lengths, set in with 10-ft. anchor rods. Construction work was carried out by a combination of Pacific Power & Light Co. crews and contractors' crews.





WWP WRITES FINIS TO D-C

W. A. Newman
Washington Water Power Co., Spokane

WASHINGTON Water Power Co. has pulled the switch on the last d-c load remaining on Spokane's once large d-c system. Conversion of this last load to a-c completes a changeover program initiated in 1923. The program was set up in three definite steps — elimination of overhead d-c distribution, elimination of almost all but elevator loads, and final changeover of elevator installations.

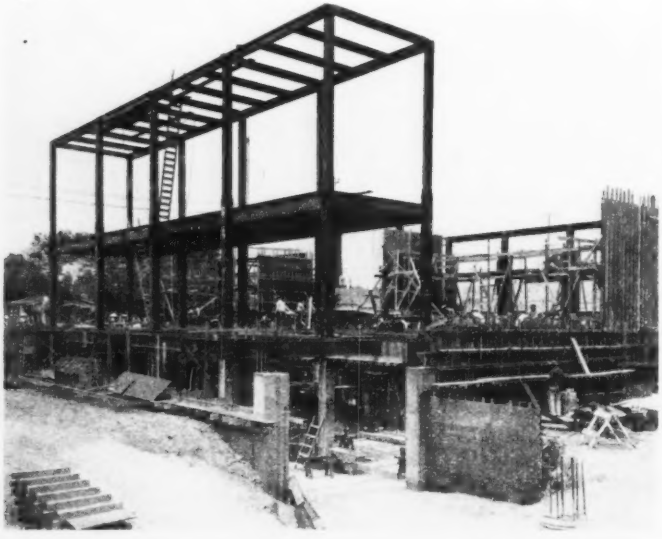
Spokane's d-c distribution system grew from an Edison d-c system installed in 1886. Although a-c was introduced in 1892 to serve residential districts and soon was pre-eminent, the d-c system continued to grow to a maximum of 10,000 kw. in 1923. At that time the company decided against further expansion of d-c, and began planning for ultimate conversion of all distribution to a-c. By 1928 all overhead d-c distribution serving areas adjacent to the downtown business area had been transferred to a-c. Next step was to convert d-c load in the downtown area. By 1940 only some 140 customers still used d-c, nearly all for elevator service.

At this time the company worked out a program to encourage these remaining customers to cut over gradually to a-c. Customers desiring additional service and agreeing to convert completely to a-c were given a rate incentive. When the customer completed his changeover, the company would refund the difference between d-c and a-c rates based on total load supplied during the changeover. Additional d-c load was supplied these customers only if capacity and facilities were available. The customer assumed the responsibility for converting such load to a-c at his own expense when furnishing of d-c became burdensome to the company.

For customers not willing to convert on this basis, the company reserved the option of replacing equipment or supplying power conversion equipment. Equipment was replaced, less reasonable depreciation, and less the saving on power supplied under a-c compared to d-c rates up to the date all d-c distribution was terminated. Conversion equipment was paid for and installed by the company, but ownership transferred to the customer. In many cases a cash settlement for obsolete equipment was made in lieu of either alternate, the amount being determined after a cost analysis by an outside electrical contractor. In most cases two electricians were called in to figure cost. With this cost analysis, a cash settlement was made between the company and the customer. The program was such that in not a single case did a customer feel that he was not treated more than fairly. In fact, the company enjoyed the best cooperation.

Thus, another of the old Edison three-wire d-c systems of the West with its tons and tons of copper has given way to the modern a-c underground network.

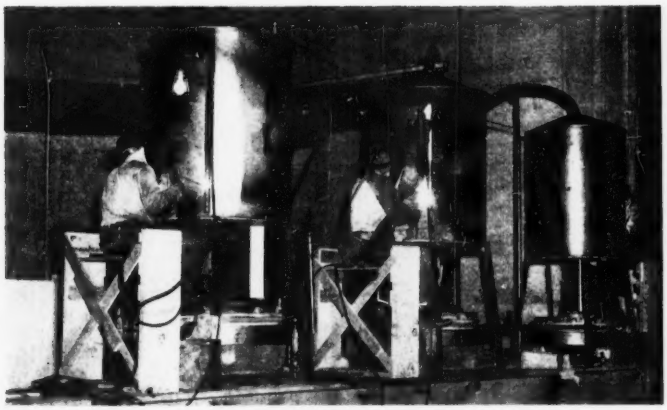
J. E. E. Royer, vice-president and general manager of Washington Water Power Co., pulls switch on last d-c load marking his company's completion of a long-range program of conversion to modern a-c underground system

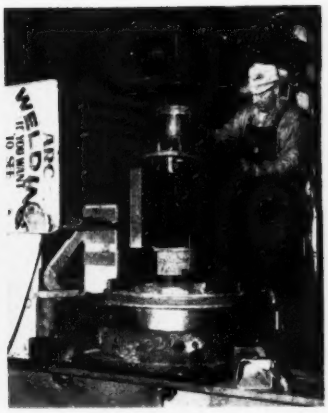


New L. A. Distributing Station

LATEST distributing station of the Los Angeles Department of Water & Power is located on Nebraska St. in West Los Angeles. The new station will cost $1,000,000; will have a capacity of 40,000 kva. and will be the department's first distributing station with load ratio control transformers. The building will have two stories and full basement. It will supplant an old station with an original capacity of 20,000 kva. but which has been carrying an overload of 10,000 kva.

Progress is well along as the accompanying photo indicates.





TURBINE WICKET GATE MAINTENANCE

R. B. Cowden
Hoover Power Plant
Southern California Edison Co.

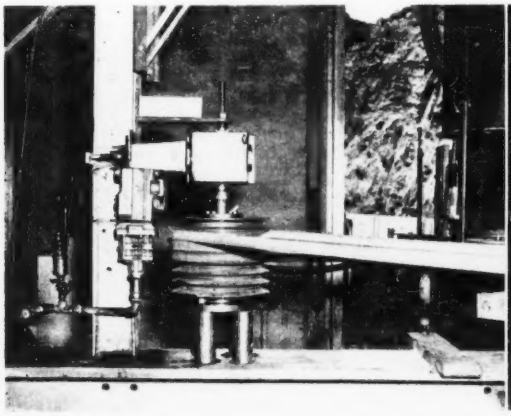
OCCASIONS may arise when it becomes necessary to improvise equipment and methods of repair not ordinarily anticipated in the general run of maintenance work in hydro plants. Such was the case during the recent major overhaul and turbine runner change on unit A-6, operated by the Southern California Edison Co. at Hoover power plant. Extensive repairs were required on the bearing surfaces of the wicket gate stems due to excessive pitting and metal corrosion. Estimated time for welding the 30-in. sections of 8-in. stem was 24 man-hours. Short outage time made it necessary to devise a method for repairing the 24 stems in the shortest time possible.

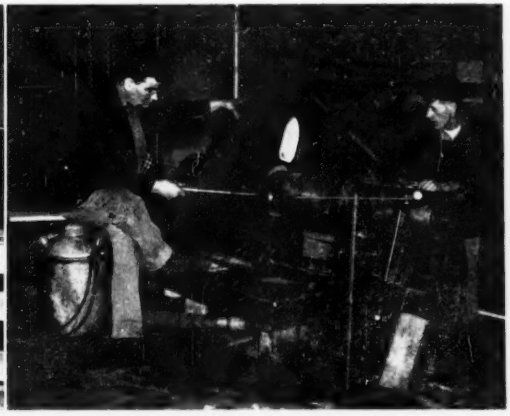
Yankee ingenuity resulted in the rig pictured. The plan allowed three of the 6-ft. 2-in. long gates to be rotated simultaneously for welding. Two 33-in. I beams were used as a base for the turntables and superstructure. Three cast-iron furnace rings, which had been discarded from obsolete structure heating systems, were used to provide a base and track for the turntable rollers, which were mounted on the outside of a short section of surplus 36-in.

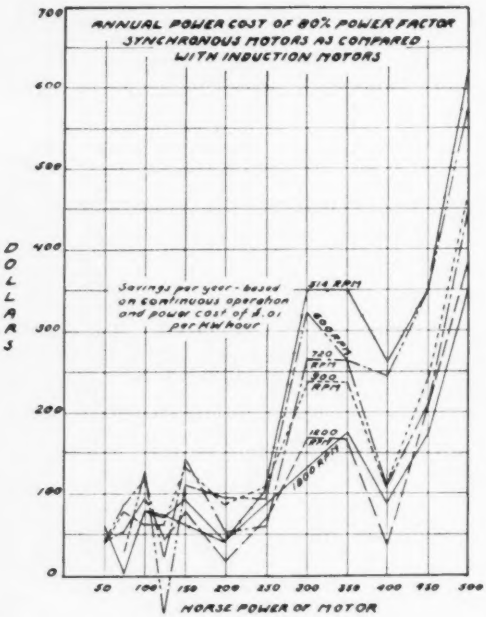
Three turntables with shields (upper left) are set up for welding wicket gate stems of Hoover Dam turbine. At upper right, long end of gate stem has been welded and gate is being lowered to rest on turntable for welding on short end. Note the V-belt drive that rotates the improvised turntable. Air motor (lower left) with multiple V-belt drive to welding turntables. Lower right: After rough turning, gate is mounted in special jig for straightening misaligned stem center caused by welding stresses. Straightening is done by the heat and water chill method

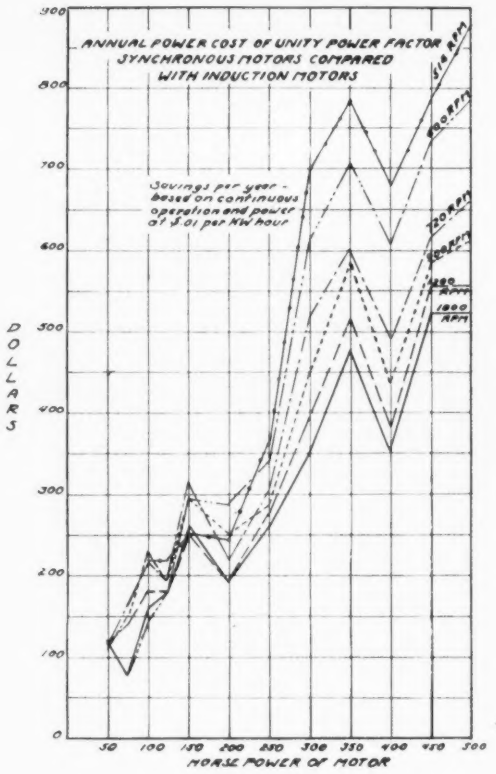
pen-stock pipe. This section was inserted in the furnace ring with the rollers resting on the track. A piece of 3-in. thick by 10-in wide mild steel with 9-in. centered hole was welded across the top of the pipe section for supporting the gates. A sheet iron hood was tasked to the rotating part of the table to prevent slag from dropping on the track. Tables were rotated by an air motor and V-belts.

At a speed of 3 r.p.m., the welders were able to apply slightly more than an inch of welding rod per hour. Gate stems were undercut $\frac{1}{8}$ in. and built up with 3 16-in. stainless steel 18-8 welding electrodes which allowed sufficient metal for finishing and polishing. Finishing was done on a special jig and checked for alignment. The gate shafts were then straightened by the heat and water chill method as found necessary. The method, although not original, may interest others.






ANNUAL POWER COST OF 80% POWER FACTOR SYNCHRONOUS MOTORS AS COMPARED WITH INDUCTION MOTORS
Savings per year - based on continuous operation and power cost of $.01 per KW hour
DOLLARS
HORSE POWER OF MOTOR
514 RPM
600 RPM
720 RPM
900 RPM
1200 RPM
1800 RPM


ANNUAL POWER COST OF UNITY POWER FACTOR SYNCHRONOUS MOTORS COMPARED WITH INDUCTION MOTORS
Savings per year - based on continuous operation and power at $.01 per KW hour
DOLLARS
HORSE POWER OF MOTOR
514 RPM
600 RPM
720 RPM
900 RPM
1200 RPM
1800 RPM

Low Power Factor in Industrial Plants

W. C. King

Los Angeles

IV. Which motor costs more to run—synchronous or induction?

IN the preceding article we saw that there are cases where an induction motor with capacitors costs about the same as a synchronous. Since it is simpler, the induction might be selected. But there is another factor, the cost of power.

It seems a common belief that the synchronous, because it supplies power factor correction, must cost more to run. The contrary is true: the unity PF motor, for all the ratings covered in these discussions, is more efficient than the induction. Even the 80% PF motor, except for a few sizes, takes less power than the induction.

The kw. input to each synchronous motor has been compared with that of the induction and the value of this difference over a year's operation has been plotted. It was assumed that the motor was in continuous operation—8,760 hours—and that power costs one cent per kilowatt-hour.

It would be a miracle if we found a motor operating under exactly these circumstances. But by plotting the curves on that basis, we can quickly arrive at the actual saving under any particular condition. *Example:*

Motor: 300 hp., 1,200 r.p.m. unity PF.
Operation: 16 hrs./day; 6 days/week
Hours/year: $16 \times 6 \times 52 = 4,992$
Cost of power: .95c kwh.
From curve: saving = $390/year

$$\text{Actual saving: } \frac{4992}{8760} \times .95 \times 390 = \$211$$

Suppose we are considering an 80% PF motor of the same rating: From the 80% PF curves we find the saving to be $165.

$$\text{Actual saving: } \frac{4992}{8760} \times .95 \times 165 = \$89$$

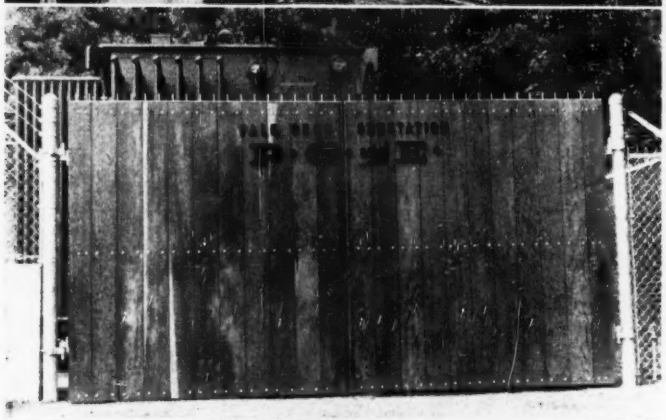
Theoretically the capacitor loss should be charged against the inducted motor-capacitor combination. But, since a capacitor is 99.7% efficient, this is usually neglected. For example, in the case above, the cost of operating a capacitor to bring the induction motor to unity would be $16 per year. When a synchronous motor is being considered it is usually for a drive that will operate a large part of the time.

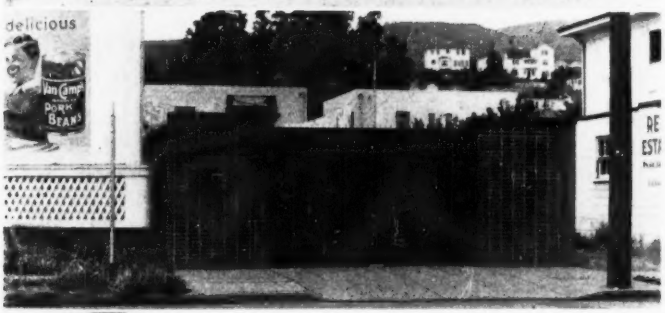
Too often first cost determines the choice of motor without due regard for the cost of power to keep it running.

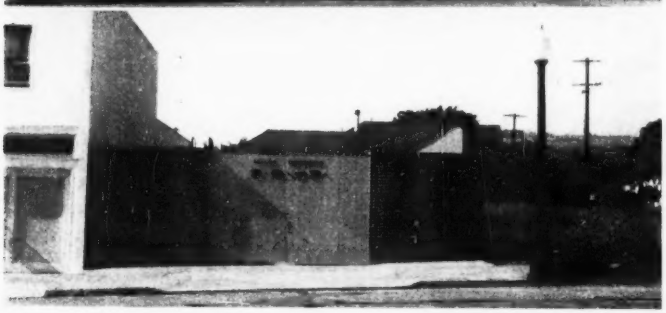
For example, take the 300-hp., unity PF motor discussed above. Even if our power costs only eight mills per kwh., it will amount to as much as the complete installation—motor, exciter and control—in less than twenty weeks of continuous operation.

The next installment will discuss, "how much correction do I get if I run a synchronous motor at part load?"

UNIT SUBS SOLVE TWO PROBLEMS







TWO important objectives have been reached through use of unit-type distribution substations, reports Clive Baugh, engineer of distribution of Pacific Gas and Electric Co. During the three years, 1946-48, more than 70 unit substations—22 kv. or 12 kv. to 4 kv.—have been purchased by PG and E. mostly for installation in the San Francisco Bay area. Standard rating is the 2,000-kva. size good for 2,500 kva. with fan cooling.

Principal advantage of the unit substation, according to Baugh, is the ability to secure additional capacity without having to build new 4-kv. feeders. An existing feeder can be cut and a unit sub installed to double the capacity. If treble the capacity is needed, two unit substations are installed on an existing feeder. Generally the utility trys to get a plot for two units when making a new installation. Primary and secondary getaways are generally underground. Air-break reclosing circuit breakers are used on the low side. Pole-top switches and fuses are used on the primary side. Four-kv. feeders are regulated by step-type regulation.

The second big advantage of the unit distribution substation is that it is compact and unobtrusive in appearance and can often be installed without any walls, false fronts or other special attempt at concealment. One of the accompanying views shows a unit substation so installed in a residential area. A wire fence and shrubbery complete the installation. Where more concealment than this is necessary, a wooden gate in a wire fence, as shown, is often used. The next step in concealment is what might be called the garden wall type. Two photographs show this type, one in a residential area and the other in a semi-commercial district.

The three general types of installation shown, using equipment furnished from any one of three large manufacturers, have so far satisfactorily met all conditions encountered by PG and E.

Unit substation located in backyards blends in nicely with its surroundings

A neat wooden gate in a wire fence is often used for partial concealment

Garden wall installation completely conceals unit sub in residential tract

Similar type of installation proves adaptable to semi-commercial district

480-Volt Wiring Saves 17%

Imposing new Prudential Life Insurance Co. building in Los Angeles where 17% was saved in wiring cost by using 480-volt distribution for both lighting and power. Dry-type load centers step down to 120/208 for lighting panelboards

DISTRIBUTION at 480 volts for both lighting and power in the new Prudential Life Insurance Co. of America building in Los Angeles is believed to be entirely new in West Coast practice. Prudential's new Western headquarters building on Wilshire Blvd. in Miracle Mile is architecturally distinctive as may be seen, as well as electrically interesting. The limit height building (150 ft.) is occupied entirely by the insurance company with the exception of ground floor space. Ground floor tenants will be a large bank, one of the world's largest drug stores, and Ohrbachs women's apparel store.

Adoption of 480 volts for power and a 480-volt primary system with dry-type transformer load centers for lighting effected an estimated savings of 17% as against use of conventional lower voltages. Load center supplied by 480 volts or higher primary voltage is now fairly common practice in industrial plants, but this is believed to be the first time such distribution has been used in an office building on the West Coast. The new General Petroleum building in Los Angeles uses the same system, but that building is not yet completed.

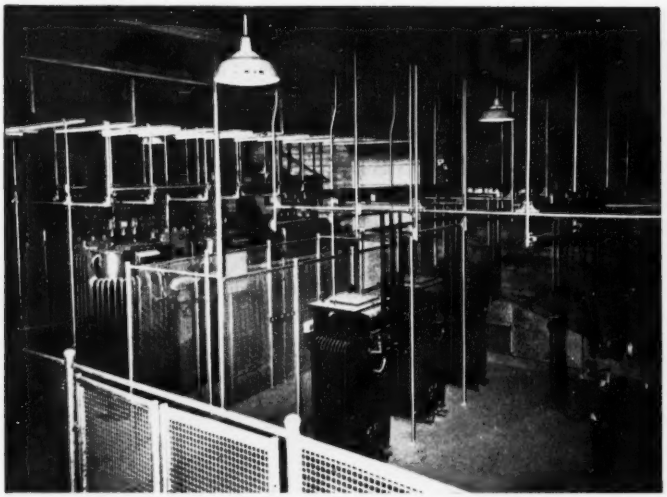
Secondaries of the dry-type transformers are Y-connected for 120/208 volts to feed the lighting panelboards. Three-phase, four-wire, 120/208-volt branch lighting circuits are used to carry the full economy of 3-phase circuits clear out to the lighting fixtures. Small 3-phase motors throughout the building are also served from these lighting panelboards—a further economy. The 480-volt power feeders serve all large motors such as elevators, and refrigeration and blowers for the air conditioning system. Control circuits from the 480-volt starters are all 120 volts, using dry-type transformers. The reason for separate lighting and power service in the building is that rate schedules of the Los Angeles Department of Water & Power, the serving utility, make separate services advantageous to a consumer of this type.

Utility Service

The method of supplying the building is unusual and interesting. Physical conditions and other considerations entered into locating a large vault or transformer room on the third floor of the building. This contains four banks of transformers served by two 4,300-volt, 3-phase delta, (utility standard) primary cables. Utility switchgear was provided for automatic throwover from one source to the other in the event of trouble. Two of the transformer banks are for the Prudential building and two serve the Ohrbachs store. Building service transformers consist of two banks of three 500 kva. each, one for power and one for lighting. Of the two banks for Ohrbachs, one serves power at 240 volts, three phase, and the other lighting at 120/240 volts, single phase. The difference in the amount of copper used to serve the Prudential building at 480 volts and that required for the Ohrbachs store at conventional low voltage is most striking to an observer.

Secondary voltage of both building banks, as mentioned, is 480 volts, three phase. Low reactance-type bus for both lighting and power buses varying in size from 1,000 amp. to 3,000 amp. extend from the customer's third floor switchboard room throughout the building. Lighting buses serve four load centers varying in size from three 100-kva. dry-type transformers to three 200's. Four-

Ceiling of service hallway was utilized for five 480-volt busways carrying approximately 3,000 kva. in small space



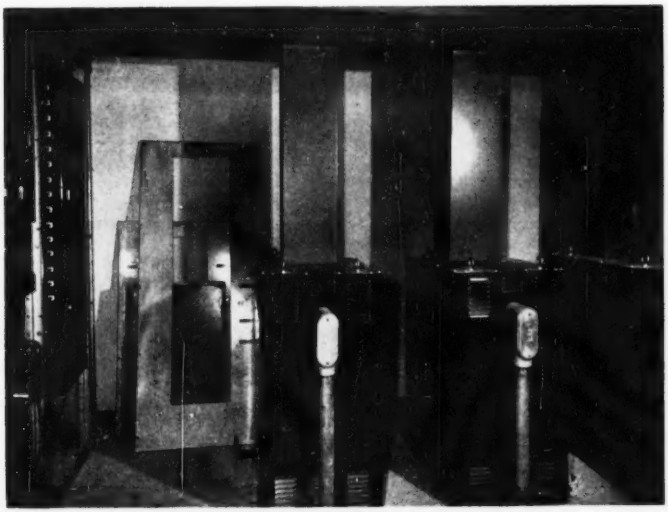
Third floor transformer room contains four transformer banks of Los Angeles Department of Water & Power. Two 500-kva. banks serve light and power for the Prudential building; the other two banks being for the Ohrbachs store

Customer's main 480-volt switchgear. Load center shown at rear. Note watt-hour meters for various departments

wire, 120/208-volt feeders from these extend to the lighting panelboards. Circuit breakers were used throughout the job.

Space limitations made it necessary to install bus runs on the ceiling of a third floor service hallway to the point of junction with the vertical buses. Because of the compactness of bus duct and the use of 480 volts, it was possible to carry approximately 3,000 kva. on the ceiling of a 7-ft. hallway. Had power distribution been at 240 volts and lighting feeders been 120/208 volts instead of both at 480 volts, some provision other than the ceiling of the hallway would have had to be made for bus runs. One of the accompanying pictures shows these runs.

One of five dry-type load centers stepping from 480 volts, three phase, down to 120/208 volts, four wire, three phase for serving lighting panelboards and small 3-phase motors. Load centers vary in capacity from 150 to 450 kva.



Lighting

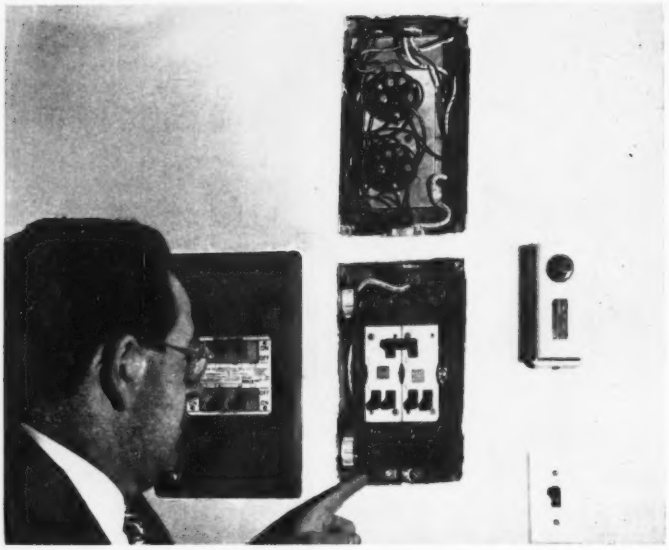
Several types of lighting using both incandescent and fluorescent lamps were required to meet varying needs and conditions. Large office areas are provided with a special two-lamp plastic shielded fluorescent fixture. These are arranged in long rows and provide a general level of about 35 f-c. Executive offices are lighted with flush-mounted glass-covered, single-tube fluorescent fixtures patterned on the ceiling in squares or rectangles, depending upon size of the office. In the directors' room, deep, square wooden louvers with small fluorescent tubes mounted on the ceiling are very effective.

Lobbies and hallways use a special decorative totally indirect incandescent fixture. The large employee dining room is lighted with indirect incandescent fixtures using 300-watt silver bowl lamps. In halls and stairways a two-tube recessed fixture is used. The employees health center uses a special fixture made for the purpose; the employees lounge also uses a special incandescent fixture designed to harmonize with architecture and furnishings. Exterior of the handsome building is floodlighted with batteries of floodlights.

Completely equipped for sound, using a music program service with central control and timing, and with other features for employee welfare, the new Prudential building is an outstanding example of modernity.

Built-in Radiant Electric Heating-II

Last month installation methods and wiring rules were given. This article relates some of the difficulties to guard against and reports experiences, costs of operation and means of control



L. N. Roberson points to the 45-amp. load-limiting relay in the circuit-breaker enclosure, connected on the line side, to actuate the time-delay relays in the enclosure above and thereby limit demand on apartment service to 50 amp.

ADVANTAGES of radiant heating have been so attractive that many have had systems installed without considering some of the necessary controls and heat insulation without which the system cannot operate economically. Others have experienced some electrical leakages or failures that were at least costly, if not sometimes dangerous. Insufficiently careful installation, use of wire or cable either of unsuitable metal alloys or insulating compounds that behaved unexpectedly and even, in one case, sabotage, caused these electrical breakdowns.

The purpose in enumerating such difficulties here is not to condemn the system but to emphasize that it should be thoughtfully engineered, installed carefully, protected during the construction period, and designed for proper control. Electricity is a premium fuel. Neither the customer in whose house it is used for heating, nor the industry which is currently very short of it, can afford to waste it. Electric heating undeservedly bears many scars already from mistakes of the past. It is still the *best* way to heat.

Wire and Insulation

Resistance wire, of course, is the heart of the radiant heating system. It must be of such character as to provide a safe low temperature and of such size that it can be concealed in the normal thickness of plaster.

At first, experiments were tried with plain uninsulated iron wire. In one case this wire was wound over panels of corrugated paper and the whole assembly encased in concrete. While first tests proved satisfactory, the iron wire corroded in contact with the alkalies of cement. Even the lead sheath of commercial soil-heating cable, in contact with cement in concrete, corrodes. In last month's article, it will be remembered, William Selfridge, electrical contractor of Fullerton, told how lead soil heating cable should be laid on building paper and covered with a coating of hot roof asphalt. That would protect it from the alkali in the cement, as well as allow for expansion.

L. N. Roberson has experimented with several kinds of resistance wire in an insulation which he claims is waterproof, oilproof, extremely slow aging, heat resistant and has a high electrical strength. He does not specify whether the insulation is thermoplastic or thermosetting. The wire was originally designed for use as soil- or water-heating cable in greenhouses. For building use, units of this cable in various wattages are made up, with a 5-ft. non-heating copper conductor lead at each end so that the element may be terminated in the thermostat of switch box without affecting the critical operation of the thermostat. Seattle's electric code calls for glass fiber sleeving or loom from the heating element end to the terminal box.

Resin Industries of Santa Barbara also makes up units of 1,000 watts each from a polyvinyl insulated Chromex No. 18 resistance wire, equipped with three-foot non-heating copper leads. The 1,000-watt element runs to 154 ft. in length and is sold in coils, individually packaged.

Both of the above mentioned resistance wires or cables are single-conductor wires.

According to Thomas Matney, chief electrical inspector, state of Washington, there have been some failures of copper alloy resistance wires encased in polyvinyl chloride insulation which he attributes to chemical reaction of the copper to the chlorine in the compound when heated. The nickle-chromium type of resistance conductor, however, has not shown such reaction. He also sent samples of both the polyvinyl insulated wire, new in addition to some which had failed. The sample on which the insulation failed was in use less than one year, Matney said. "In talking with Mr. Roberson," Matney continues, "I am informed that the tophet C resistance wire also shows corrosion although not to as great an

extent as the copper alloy. The insulation failure is about the same as of the copper.

"At the present time," continued Matney, "there are 1,000 to 1,500 buildings and homes in the state heated in this manner, in a majority of which conductors are insulated with a thermosetting plastic and no trouble has developed. This insulation has stood up exceptionally well. Some of the first jobs installed in 1939 do not indicate or show signs of insulation failure. The flexibility remains excellent and samples tested have withstood 2,500-volt potential test."

Some installations were made in southern California with a glass fiber insulated Nichrome wire, silicone coated. It proved satisfactory in some installations but in two cases, as reported by Selfridge last month, there developed "grounding from the element to the sink."

At the Southwestern Section, International Association of Electrical Inspectors annual meeting at Oakland in late September, Delbert Hansen, chief inspector of Oakland, told of other installations in which insulation had either broken down or the heating element had in some way become exposed to moisture and caused a potential difference between the element and grounded plumbing fixtures. At that time he expressed the thought that what was needed was some type of resistance unit with a sheath over it that could be bonded to the grounded system of the building. Then, in case of failure of the insulation, the leakage of electricity would go directly to ground and not through some path which might involve a person walking on the floor and contacting grounded plumbing fixtures. He spoke of grounding the sheath of lead-covered cable as a possible means of providing this safety.

Since that time the Rockbestos Products Corp. has announced a type of house-heating cable, which its Pacific Coast manager, P. O. Weston, says has been under test in its own laboratories the last four years. It is a two-conductor heating element cabled together with a bare third conductor by which to ground the helically applied galvanized armor protecting the assembly. Insulation of the two current-carrying conductors is of nylon and felted asbestos, with moisture resisting coating. This cable is to be distributed in standard wattage lengths of 200 ft. for 500 watts at 120 volts; 500 ft. for 1,500 watts at 240 volts; 700 ft. for 2,000 watts at 240 volts, and 1,000 ft. for 3,000 watts at 240 volts. Conductors are either Hytemco, nickel, bronze or copper; the bare copper conductor being of a size comparable to the size of the current-carrying conductors. It forms a low resistance path along the armor so that a protective device, fuse or breaker, will open the circuit if a fault occurs. Without it there might be a fault which would develop high temperature at the break without being of sufficient current magnitude to open the protective device. This cable passes high dielectric tests, ranging between 9,000 and 20,800, dry or wet.

Because it uses two conductors and a grounded sheath, this element causes no hum in the presence of steel lath or other metal. Claimed for it also is that it does not corrode in plaster or cement nor leave lines on the plaster. In appearance it is like armored twisted pair low-voltage control wires. Other attributes are mechanical protection to conductors during construction and a larger area of radiating surface. It is designed to operate at a maximum conductor temperature of 149° F. to comply with Washington State rules.

To assure the inspector that standard cable lengths have not been cut by the contractor, thus lowering resistance and increasing heat, the ends of the element lengths are to be banded with a metal sleeve. No non-heating leads are provided, however. Weston suggests that the cable can be controlled ideally through low-voltage thermostats and relays. Fusing recommended is for 8, 10, 15 or 20 amp. at 120 volts or 240 volts according to the element length and wattage. Maximum ampere flow is considerably below these values.

Announcement has just been made of another product that may find use in radiant panel heating. The Los Angeles Department of Water & Power reports a resistance element like paint, brushed or sprayed on a surface, called Electrofilm, and developed in Los Angeles by E. R. Hall Co. Originally designed for use in aircraft for de-icing wing surfaces, it is adaptable to numerous other heating uses. By changes in the compounding of the material in liquid form specific resistance can be changed. Thickness also controls resistance on a given area. Wattage ranges from 15 per sq. ft. to 35,000 per sq. ft. have been produced. Fractures of the element or insulation are said to be repairable by brushing insulating varnish into the break.

Certainly in any system used, continuity of the heating element is of prime importance to the owner of the building for, should a break occur in the element buried in the plaster or floor, it would mean abandoning of that element with the heat represented by it—from 500 watts on up to 3,000 watts of heat. Injury can be inflicted to these wires during construction. The rough treatment a floor gets from concrete wagons, heavy boots, falling lumber or saw horses, all can damage the wire or its insulation. For that reason Roberson recommends immediate testing of each element or unit after plaster or cement is laid to assure its operation. If a break is to be repaired, that is the time to attend to it. Selfridge also recommended stationing a man to watch it during the pour. He testified in court in some cases involving systems that were either deliberately sabotaged or damaged in the construction stages.

Should leakage develop in concrete floors, asphalt tile has been used to insulate the floor from persons walking on it. Too rich a mix of cement has also been known to cause cracks which pull the element wire apart. Expansion joints in the floor are therefore recommended.

Although Roberson has requested Underwriters' Laboratories to investigate this type of heating and issue a fact-finding report for the guidance of code authorities, the Laboratories have had difficulties because there are no standards established as yet by which to measure or check such systems. Those that have been installed so far have been by special permission of inspection authorities, except that in Washington, first Seattle and then the state prepared rules (see last issue). Rockbestos also has submitted its wire to the Laboratories but the same lack of standards prevents very early action.

Installation Costs

Cost of installing such a system is still a matter of some speculation. Naturally conditions vary in each job but the disparity of figures is still confusing. A contractor and his crew familiar with installation of such a system should be able to do it economically.

Contractor Selfridge, last month, said the resale cost, or cost to the customer, could be estimated at from $1 to $2.50 per sq. ft. for the soil heating cable in concrete slab installation. Originally Southern California Edison Co. engineers cited a range of installation cost of from 15 cents to $1 a square foot for the cable itself. Selfridge includes thermostats and heavier main service in his estimates. He also installs capacity for 100% load factor on the heating.

There are no data available at this writing as to the range of costs in the Northwest. Weston estimates that, with his cable, a five-room house in Seattle, with 16.1 kw. of heat, would run about $350 for wire and one thermostat and about $250 for labor of installing, all of which estimates.

he says, are generous. Roberson estimates in his literature that the system he designs will cost approximately a third that of installing a heating plant using gas or oil. He recommends 1½ watts per cu. ft. for rooms over 2,000 sq. ft.; 2 watts per cu. ft. for those under 2,000 sq. ft.

Operating cost, too, runs all the way from high to low. That, too, depends on how well engineered the job is and how well insulated the house, plus how intelligently the system is operated by the householder. In some Oakland installations the monthly power bills have been excessive. Complaints have showered upon the power company but the real causes were in lack of insulation and possibly mistakes in design.

In southern California several jobs also brought complaints of high bills. On investigation the power company found that the people living in the house were not operating the system to good advantage. With the concrete slab job there is a time lag both in heating up and cooling down. Dual thermostats, one with a bulb in the concrete, one an outside thermostat to anticipate the temperature change before it becomes apparent inside, can give better economy of operation. For if a householder opens all the windows to cool a house that stays warm after the sun has come out, there is a waste of residual heat that has been generated by electricity and that has been measured by the meter. In areas where there is a short heat cycle, this lag is something to be considered in the design of the system.

The Edison company estimates that it should cost about $3 per kw. per year in southern California climate, with reasonable operation.

Roberson has compiled figures showing annual kwh. consumption for 1940-41 for a house (presumably his own) to be: heat and light, 18,155; water heater 8,414; range 1,098; clothes dryer 1,810; greenhouse 9,043, making a total of 38,520 kwh. There are 19.5 kw. of heating using his cable in house and the same in the greenhouse. At 1c per kwh. rate, Roberson feels that operating cost is comparable to oil at present prices. An average of 2.22 kw. per cu. ft. per year is cited as the cost for a number of homes over a six-year period — including lights, range, water heater, etc.

What Kind of Load?

Supplying utilities are much concerned with electric heating, particularly in these days of generating capacity shortage. The state of their distribution lines and substations likewise makes electric heating an undesirable load until they have a chance to rebuild much of their facilities to take these increases in kw. connected.

Matney writes of the situation in the Northwest: "Tests by both Washington State College and the University of Washington have shown that the heating cycle used in the coldest winter runs approximately 12 to 20 minutes on and from 90 to 120 minutes off. This is with the element embedded in the plaster ceiling. With the element embedded in a concrete floor with insulation, there is approximately a four-hour storage before the temperature drops more than 2° F. When the floor is not insulated, there is approximately a two-hour storage. This huge storage is utilized to allow the load-limiting devices to operate.

"The power companies in some localities use time clocks to drop this entire load during peak hours. One power company is proposing to drop the load by carrier-current relays for emergency cases.

"Relays for interrupting the heating circuit are of the thermo-time-delay type and are arranged to cascade so that the relays open at intervals from 30 seconds to one minute. This also provides the utility with a time interval to reclose the breakers after a long outage without having this heating load piled on top of their normal load. As the time-delay relays trip clear on power failure and do not start to reclose until approximately one minute after power is restored and as they reclose in cascade, the larger installations may require ten or 15 minutes before the entire load is back on the line."

To meet the problem of demand on the power company system, Roberson has suggested the use of double-throw thermostats and more recently, the time-delay relays and load-limiting relays mentioned above by Matney.

With the simple double-throw thermostat, the electric water heater is sometimes placed on one side of the double-throw; sometimes another room is put on the other side. Since the heating load is on only a small part of the time, the double throw thermostat throws the current over to the water heater when the panel heating is off, and vice versa. There is ample capacity for both uses. The person occupying one room is never aware that during the off interval the current is used to heat the water or another room. This reduces the number of circuits required, the size of the service equipment, and gives a better load factor to the power company. It limits demand and reduces peak load.

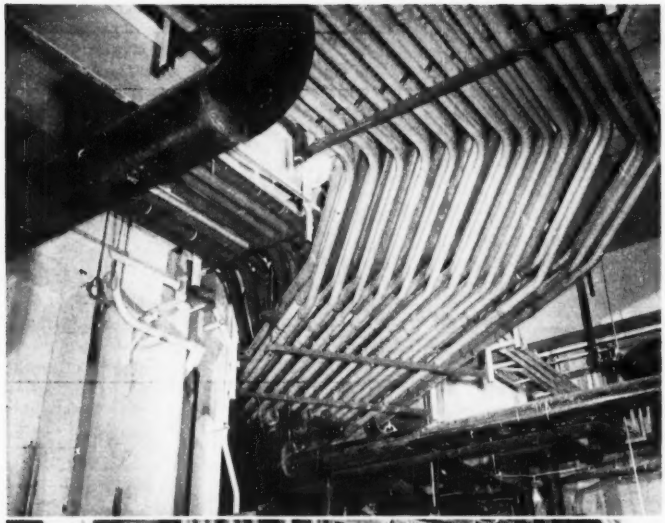
The time-delay relay system is an added refinement and limits the load to 8.4 kw. on a 220-volt service. It has a 45.5-amp. overload self-resetting relay on the load side. If the load exceeds 8 kw. this relay opens the control circuit which de-energizes the first time relay, which opens on a time delay of 30 seconds and de-energizes the next relay, etc., in turn. When the load decreases below 8 kw. the procedure reverses and restores circuit continuity. In case of power outage all relays open and the relays close in sequence of 30 seconds apart.

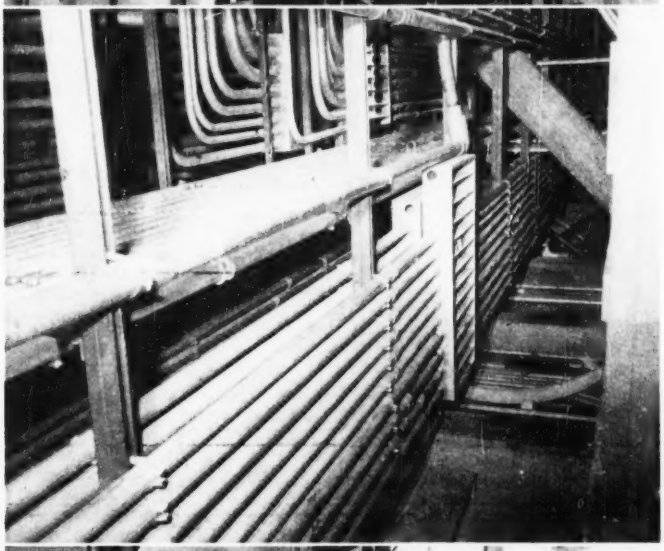
Another system that has many advantages was described last month in ELECTRICAL WEST, page 83. It is a Wesix automatic double-throw switch that throws the heating load over from 240 volts to 120 volts when the total home load for cooking, lights, etc., exceeds a predetermined demand.

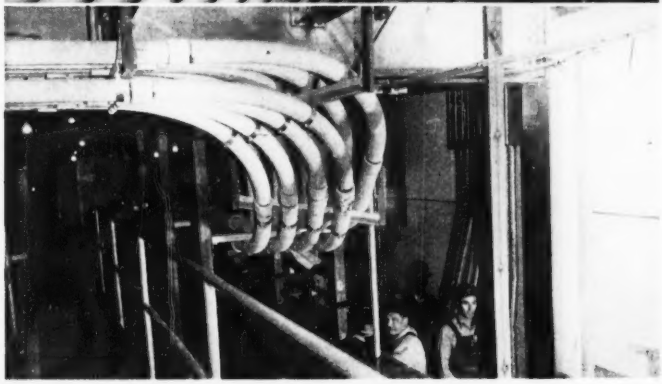
One big advantage to the customer of such control of the heating load comes from reduced service equipment cost. For installations requiring over a 100-amp. main, metering must be done through current transformers, the service conductors and equipment are all required to be bigger and more expensive, and the assembly takes so much space it is difficult to make it look good.

Altogether the advantages of radiant electric heating so far outweigh the minor difficulties that it is in popular demand, and that demand is growing. In many respects it is the ideal heating system. It takes no space. It is clean. It permits the use of all wall space or floor area, an important consideration in high-cost-of-building times like these, when every square foot must be utilized because it costs so much. It gives more natural comfort without hot or cold areas or sections. The heat is uniform. There are no drafts. Higher humidities can be maintained indoors in winter. The air is clean for breathing. High ceilings, large glass areas and concrete floors are no deterrent to its efficiency for the radiation flows in straight lines and is not affected much by the atmosphere. It is reflected like light from glass or other surfaces, or is absorbed and reradiated. The fire risk is negligible. There is no trouble with leaking radiators, steam or water lines, smoke or soot from leaks in a hot air system. Housecleaning and redecorating costs are at a minimum. Comfort is at a maximum.

Whether the industry is ready for it or not, electric heating is here to stay and the public, never one to be satisfied with less than the best, is beginning to demand it. The industry's job is to provide it in the most efficient and practical methods possible. Built-in radiant electric heating is one of these.







Difficult Conduit Job

Electrical contractor furnishes the know-how

INSTALLATION of the extensive conduit system required for control circuits and for power and lighting in a large modern steam plant can be an intricate and difficult job. So found E. M. Robinson, foreman for Chas. A. Langlais Co., electrical subcontractor on Pacific Gas and Electric Co.'s new 100,000-kw. Station P steam plant in San Francisco.

The accompanying photographs show some of the contortions that conduits had to be made to go through. There were numerous runs involving multiple-angle bends requiring experience and know-how in laying conduit. Space limitation was a constant problem calling for great care in laying out multiple runs. The number of conduits for a steam plant of this type with completely centralized control is perfectly amazing.

The first of two 100,000-kw. units at Station P was rushed to completion by Pacific Gas and Electric Co., and placed on the line December 14, in time to help carry the winter peak. The second 100,000-kw. unit is well along and is expected to be ready for service in late January 1949. Another large steam plant is under construction at Moss Landing on Monterey Bay and one will soon be started at Antioch in the San Francisco Bay region.

Stone & Webster Engineering Corp. is designers and erector of the plant.

One of the difficult conduit runs at Station P. Here some fifty control circuit steel tubes dropped elevation and turned an angle at the same time

Maze of conduits in control circuit tunnel gives some idea of complexity and tremendous number of conduits required in present-day steam plant

An exacting job requiring know-how in conduit laying was this installation of Transite duct making a downward swing at same time turning an angle

SCHOOL LIGHTING DEMONSTRATED

IN order that school officials, parents and all those interested in classroom education might see an example of proper school lighting, a local committee of the B. C. chapter of the IES, working with the North Vancouver, B. C., school authorities, conceived the idea of relighting two classrooms of the high school to IES standards. The plan further provided that one room would be lighted with incandescent and one with fluorescent in order that a direct comparison might be made. Two identical rooms were selected. 24 ft. x 32 ft., with 12-ft. ceiling. One was the typing room, the other the bookkeeping room. Both had windows on the west side.

With the cooperation of the electrical industry of Vancouver the project was carried through to completion practically without cost to the school board. By early fall the two relighted, redecorated rooms were ready for display. During September about fifteen meetings of school officials and P.T.A. groups were held at the school. The more than 350 visitors who attended were most enthusiastic about the changed appearance of the rooms. It is hoped that this classroom relighting project will serve as a guide to school authorities who are planning projects of their own and that it will kindle the interest of the public at large who want their children to benefit from better seeing conditions and not be subjected to conditions that exist in so many schools today. The modernization of the lighting in these two rooms is not in any sense radical. It was planned to meet the recommendations of the IES school lighting code and thereby ensure lighting that will provide good seeing conditions for young eyes. If enthusiasm of school trustees is any indication, it is felt that the demonstration will result in greatly improved conditions in classroom lighting in British Columbia schools within the near future.

The committee went further than merely carrying out the relighting job. It compiled and made available in a mimeographed report full data on before and after conditions and a complete cost comparison of the two types of lighting. The cost analysis part of this report is here reproduced. The accompanying photographs show before and after lighting results.

Top: Fluorescent installation with average maintained level of close to 39 f-c. Below: Before and after views, showing contrast between old classroom lighting using four 150-watt inside-frosted lamps without enclosing globes and new incandescent lighting using nine 500-watt bowl-reflector lamps averaging an intensity of 23 f-c

LIGHTING COST ANALYSIS — NORTH VANCOUVER HIGH SCHOOL

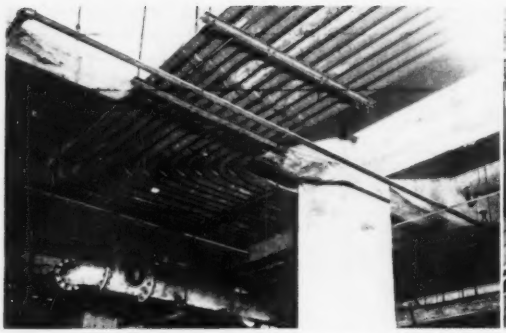
Information used in the actual lighting design calculations was obtained either directly from the equipment manufacturer's representatives or from their official publications. A number of the figures used in determining the various costs have been based on estimates. However, any discrepancies which may exist in these estimates should not affect the final results too seriously, inasmuch as the costs for both systems are calculated using similar formulae.

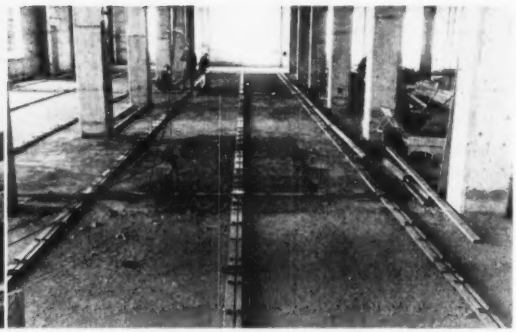
Item	Details	Incandescent	Fluorescent
Illumination Design			
Size of rooms	Ea. 24 ft. x 32 ft. x 12 ft. high = area	768 sq. ft.	768 sq. ft.
Type of fixtures used		Amalgamated 210—PL	Curtis 40/60
No. of fixtures used		9	21
Type of lamps used		500W. SB	40W. 3500°F
No. of lamps used		9	42
Room Index		E	F
Utilization factor	75% ceilings—30% walls	.31	.43
Maintenance factor		.70	.70
Lamp Lumens		9250	2100
Maintained F-c	**Incandescent** $\frac{(9\times9250)\times.31\times.70}{768}$ **Fluorescent** $\frac{(42\times2700)\times.43\times.70}{768}$	23.5	37.7
Estimated lamp life	Assuming an av. 3 burning hrs. per start	1000 hrs.	2500 hrs.
Lamp watts per fixture		500	80
Ballast loss per fixture	Tulamp ballast	—	15.5 watts
Total watts per fixture		500	95.5
Equipment Cost			
Net cost of fixtures	**Incandescent** 9 @ $24.50 list less 15% **Fluorescent** 3 @ $49.50 + 18 @ $45. list less 15%	$185.13	$814.74
Net cost of lamps	**Incandescent** 9 x $2.40 list less 20% **Fluorescent** 42 x $1.30 list less 20%	$ 17.28	$ 43.68
		$202.41	$858.42
Installation & Wiring Cost	This is an arbitrary figure	150.00	150.00
		$352.41	$1.008.42
Annual Owning Cost	@ 15% per Yr. inc. Int. & Insurance not incl. lamp cost	$50.27	$144.71
Maintenance Cost	Cleaning & relamping per yr.		
	Incandescent—@ 15c per fixture	$1.35	
	Fluorescent—@ 20c per fixture		$4.20
Annual Burning Hours	Assuming classrooms occupied 1200 hrs. per year	800	800
Annual Lamp Replacements		7.2	13.44
Annual Lamp Cost		$13.73	$13.98
Load in Kw.	**Incandescent** 9x500=4.5 **Fluorescent** 21x95.5=2	4.5	2
Annual Energy Cost	Assuming 10 mo. operation—80 b. hrs. per month Standard step rate 5c & 2c (Average 4.4c)		
	Incandescent 80x4.5=360 KWH per month	$159.80	
	Fluorescent 80x2=160 KWH per month		$71.00
Annual Operating Cost	Sum of energy, lamp, and cleaning costs	$174.88	$89.18
Total Annual Cost	Sum of operating and owning costs	$225.15	$233.89
Annual Cost per F-c		$9.58	$6.20
Annual Cost per Student	Assuming 40 students per classroom	$5.63	$5.84

Cost of fixtures was based on List less 15%
Cost of lamps was based on List less 20%

Fixture Paradise

A COMPLETE set of display rooms such as few dealers could justify in their own stores is made available to contractors and dealers in the San Francisco Bay region by California Electric Supply Co. A large part of the main floor has recently been modernized to provide separate display rooms or areas for porch, entranceway, living room, dining room, kitchen, bedroom and workshop lighting fixtures and portable lamps by Lightolier. And each fixture is lighted by its own push button through an extensive Touch-plate control system. Atmosphere and decor of each type of room is provided. Dealers bring their customers or send them in with assurance of trade protection, plus skilled salesmanship.





Main switchboard will serve connected load of 5,400 kw. Board is in three sections fed by three 4,000-amp. services from two power company vaults. Bus tie breakers permit operating as a single bus. Right, four 1,200-amp., 65-volt d-c generators driven by 115-hp., 208-volt motors comprise part of heavy telephone load on the eighth floor

PHONE BUILDING HAS 5,400-kw. LOAD

A LOAD of 5,400 kw. in a 15-story office-type building is something quite unusual. That, however, will be the connected load in the Pacific Telephone & Telegraph Co.'s new building in Oakland, now under construction. The building is 233 ft. 7 in. high, about the equivalent of 24 stories in an ordinary building; ground area is 128x144 ft., and total floor area, 300,000 sq. ft. The building is heavily braced against earthquake shock and in all other respects is strictly A-1 construction.

Provisions for supplying a load of 5,400 kw. in a building of this size is of electrical interest. Three 4,000-amp. 120/208-volt network services are brought in from two Pacific Gas and Electric Co. vaults. These feed three separate bus sections of the 45-ft. main General Electric drawout-type board pictured, through 4,000-amp. air breakers. Two 4,000-amp. bus tie breakers permit the three sections of the bus to be tied together in case of emergency if desired. Emergency service is presently available from a 400-kw. diesel-engine-driven generator. Ultimately there will be three such sets. Upon loss of potential or other abnormal condition on the center section of the main bus, the auxiliary set starts and emergency source breaker closes after first opening the interlocked main breaker from the power company source to prevent paralleling.

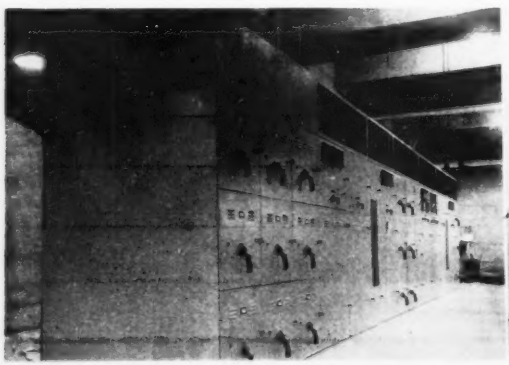
Metering such a three-feed service offered problems to the power company. After much deliberation, it was decided to combine the current from the three sets of current transformers and use one kilowatt-hour meter, one rkva. meter and one demand meter.

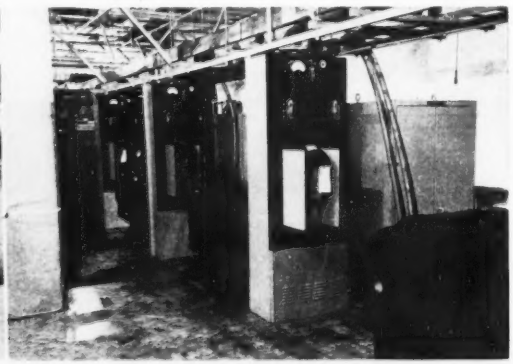
Adhering strictly to tried and proved P. T. & T. practice, the heavy loads up through the building are served by a number of 500,000-cir. mil four-wire risers. By contrast, many new commercial buildings use a single vertical bus duct, or primary cables are run to a transformer bank on some one of the upper floors, usually the top on account of the elevator load. In the new telephone building, three feeders, two from the center section of the main bus and one from another section, serve the eighth floor where there is a connected load of 1,200 kw. On this floor there are a number of motor-generator sets, an immense storage battery with m-g set, and a great deal of other special telephone equipment.

Fluorescent lighting is used throughout the building except in switchboard rooms. Here again, the telephone company stayed with the older of alternate practices. Silver-bowl, 300-watt lamps are used in suitable fixtures to provide 15 to 20 f-c of totally indirect lighting on the telephone switchboards where operators work.

Electrical contractor on the job is Matson Electrical Equipment of Oakland. Consulting electrical engineer was Lyle Patton of San Francisco.

Twelve 4-wire, 120/208-volt, 500,000-cir. mil risers (left) serve distribution panels on the upper floors. Right: Walker floor duct was used throughout building





PANORAMA OF THE PCEA

Edited by A. X. Schilling

Home Economics Course

An impressive series of classes, for which college credits may be obtained, has been planned by the PCEA home economics committe for the San Francisco region. The series consists of fifteen two-hour evening classes to be conducted in the PG and E auditorium, 245 Market St., San Francisco, beginning Jan. 26 and continuing weekly until the final examination session on May 4.

The course has been approved by the San Francisco State College for college credit and by the San Francisco schools for teacher increment credit. It will be open to all teachers in the Bay area, as well as to interested persons in the electrical industry. The course carries a two-unit college credit.

Weekly sessions will be devoted to the following subjects: electricity; home wiring; two meetings on home lighting; kitchen planning in the home; kitchen planning in homemaking departments; three meetings on electricity and food preparation; two meetings on electricity and home laundering; electricity and housekeeping; indoor climate; electricity and home entertainment and education; and one session of examinations.

Marguerite Fenner, PG and E's director of home economics, and chairman of PCEA's home economists committe, is in charge of the series.

Farm Handbook

With much of the data already assembled, the new revised Farm Electrification Handbook is expected to be ready for distribution soon. Thor W. Christensen, PG and E, is chairman of the handbook committee. Assembling the material for the various sections are: Prof. B. D. Moses, University of Calif., Davis, miscellaneous uses section; Elbert Kramer, Westinghouse Electric Supply Co., farm wiring section; H. R. Haines, Southern California Edison Co., engineering data section; V. E. Dodson, General Electric Co., and S. S. Van Voorhies, General Electric Co., motors & control section; Chester N. Fuglie, California Electric Power Co., domestic farm uses section; W. F. Chapman, San Diego Gas & Electric Co., poultry section; James H. Rae, Southern California Edison Co., agricultural pumping section.

● The Electrical Industry—PCEA in particular—has been awarded special recognition by the Association Executives' Trade Conference, for which V. W. Hartley, PCEA's managing-director, recently concluded a term as president. The conference gave Hartley a handsome desk pen set in recognition of his services to the group, which represents about 100 associations.

Coronado in May

The Hotel Del Coronado, at Coronado, will be headquarters for the annual spring convention, scheduled for May 25, 26, 27. Marshall C. Wells, Sues, Young & Brown Inc., has been named convention chairman and will complete the formation of his various committees soon.

AW Standards

Some 2,000 members of the Building Contractors Assn. of California soon will receive copies of the certified adequate wiring standards, along with a letter from their executive vice-president, E. V. Sills, Los Angeles, encouraging them to adopt the standards as specifications for the homes they build. This cooperation on the part of Sills is expected to add a considerable impetus to the adequate wiring project in California.

Metermen's Institute

A five-meeting institute for electric metermen will be presented Jan. 31 to Feb. 4, inclusive, by the University of California, Berkeley, Extension Division, with the cooperation of PCEA. The registration fee is $20 and more than 40 persons are expected to enroll. W. N. Lindblad, chairman of a meter group subcommittee, assisted in arranging the series.

Convention Reports

Although its meeting in Reno on Dec. 2 was largely devoted to fiscal matters and consideration of the 1949 budget, the board of directors heard reports from some committees and from the directors who acted as sponsors for committee meetings during the Fresno conference.

The advertising committee's pictorial report on the activities of the Business Development Section during the Fresno conference was submitted by F. M. Raymond, committee chairman, and was approved by the board. The report shows the interrelation of the problems confronting selling and other groups and will be distributed to about 1,000 interested persons.

All of the directors who served as sponsors during meetings in Fresno were impressed with the work being done by the committees and with the seriousness of purpose with which the committees had considered their problems.

The sponsors endorsed the patron program and recommended its continuance.

Board of director members who acted as sponsors for various groups and committees were: R. N. Dreiman, accounting; A. G. Jones, purchasing & stores; D. D. Smalley, safety; H. H. Courtright, steam; C. C. Ernst, Hydro; I. W. Borda, transmission and distribution; F. A. Tracy, substation; W. G. Willson, meter; G. C. Tenney, communications.

Upon receipt of M. G. Sanders' written resignation caused by his leaving the electrical industry, the board appointed Henry B. Sargent to fill Sanders' unexpired term, ending in June 1950. The new director is president of the Central Arizona Light & Power Co.

The board sent a letter of greeting to Past Director Art D. Brown, who now is manager of the Allis-Chalmers Washington, D. C., office.

NECA Convention Benefits West

From some of those who attended the National Electrical Contractors Assn. convention at Miami Beach, Fla., Nov. 28-Dec. 2, a report on the actions taken and events of significance to Western chapters and members has been gleaned. Although the resolution from the Northern California Chapter asking for an Administrative Committee and Board of Governors review of the policy and administration of NECA in labor negotiations was shushed somewhere before it reached the Board of Governors several steps were taken by the Administrative Committee to appease the West. First was authority to E. R. Cornish, field representative, to establish a Western office for NECA in San Francisco. This office would serve chapters in Washington, Oregon and California and seek to handle their top labor relations with the similar Western headquarters of IBEW in San Francisco. Another duty assigned the Western office is the editing of a Western supplement to the *Qualified Contractor*, NECA magazine, and to act as its advertising agent in the West. The Western office was strongly advocated by T. L. Rosenberg, retiring vice-president for District 6. Cornish declares the office may be set up at Western Merchandise Mart, 1355 Market St., San Francisco, providing space can be arranged for it there.

Another resolution passed at a recent District 6 meeting was anticipated by NECA in that it set up a separate director of labor relations responsible to the labor relations committee instead of to the executive vice-president. Votes on the constitution changes went pretty much as the chapters of District 6 had wished. The minimum dues increase was turned down. New districts were set up. Of particular interest is that Utah, Colorado, Idaho, Montana and Wyoming will be in a new District 10. Changes in tenure of officers and qualifications for top offices were approved. A resolution from the San Francisco chapter asking for a study of a disability and sickness insurance program for contractors themselves was approved.

L. B. Shamel, California Electric Co., Los Angeles, was elected to succeed T. L. Rosenberg, Oakland, as District 6 vice-president. Ed Buttner, Scott-Buttner Electric Co., Oakland, nominated by District 6 as a member of the national labor relations committee, will probably be appointed by President McChesney to succeed Rosenberg to that post. Rosenberg remains on the Employees Benefit Board.

The James H. McGraw medal and award was presented to Laurence W. Davis, who for 28 years has served the association, 24 of which as managing director, and recently as treasurer. The presentation was made at the banquet by W. T. Stuart, editor of *Electrical Construction & Maintenance*. Davis received the award "for his years of inspired leadership, vision and service to the electrical contracting industry and his constructive efforts toward enlisting his industry in cooperative projects for the electrical industry and the public welfare." Davis is well known in the West.

J. Scott Milne, former Western vice-president and now secretary of International Brotherhood of Electrical Workers, addressing the convention for Dan Tracy, IBEW president, told of the need for both union and contractors to start selling if construction volume and employment are to continue at 1948 levels.

Inspector's Topics

Puget Sound Chapter, International Assn. of Electrical Inspectors, elected J. E. Hitch its new chairman at the third quarterly meeting held in Tacoma, Dec. 4. He succeeds L. B. Garff. Others elected were: T. L. Matney, vice-chairman, C. S. Alger, secretary and J. H. Watt, treasurer. The planning committee was continued in office by the new chairman. It consists of Ray Larrabee, chairman, Robert Geddis, Roger Walker, Wm. Gaffney and Joseph Krivanek. The legislative committee, consisting of Wm. Gaunt, chairman, O. A. Alderman and T. L. Matney, was also reappointed. Four bills are being prepared to present to the Washington State legislature: an amendment to the contractors license law, a bill providing for licensing of electricians, a sales control bill and a bill providing for an electrical permit fee system. The meeting asked for copies of proposed bills for individual members to study. J. Frank Ward, superintendent, Tacoma City Light, discussed the power shortage situation. Contractor P. B. Alstead asked the inspector group to consider methods and equipment for wiring concrete block houses, materials suitable for use in the hollow wall spaces. Next chapter meeting will be held at Everett, Mar. 5.

George Tansey, chief of the Electrical Division, Los Angeles city, was elected chairman of the Southern California Chapter, IAEI, at its bimonthly meeting at Santa Ana, recently. E. V. Muller, Division of Industrial Safety, State of California, was re-elected secretary-treasurer. Topics discussed included the temporary service equipment allowed building contractors during new construction. Utilities were asked to require yearly inspection of such equipment connected on flat rate permits. Other topics discussed were high-voltage sign tubing used for interior residential lighting, use of navy basket-weave cables from salvage which is not U. L. listed. Jack McFarlane, contractor, asked for more uniform local codes, based on the latest edition of the National Electrical Code. Next meeting will be held at South Gate, Jan. 26.

New Mexico Chapter

Newly created New Mexico Chapter of IAEI will hold its initial state meeting Jan. 8-9 at Albuquerque. Robert L. Thompson, engineer and chief inspector for the electrical administrative board of the state, will preside at this organizational meeting. The four wholesalers of Albuquerque have pledged support of the meeting and will assist in getting speakers and program as well as in entertainment. Thompson says there has never been a get-together of this kind in New Mexico but that, with some 300 licensed contractors, the time is ripe for such a chapter and its educational program on the code.

IAEI

Utah Chapter of the International Association of Electrical Inspectors were guests of General Electric Supply Corp on Dec. 14. C. F. Grant, Utah Power & Light Co., discussed articles 370-374 of the code and also talked on "*Making Provisions for Meter Installations.*"

Bureaus

Part 2 of the free sales training courses of the Northern California Electrical Bureau will get under way early in 1949, and will offer instruction on how to sell the electric range, electric water heater, refrigerator, and home laundry equipment. Preview of the course will be given to wholesale and manufacturers' representatives before it is offered to the retail field, during the customary Christmas season wholesalers sales meetings.

Dealers Association

Seattle Association of Appliance Dealers will put out a directory of authorized service stations for dealers in its area.

Frank Porath, San Diego Electric Club president, and Dick Hamann, student. Club sponsors and committee members: Jim Lyon, Bruce Gravitt, Ben Lacey, Percy Pine, chairman.

President Frank Porath, Bruno Barth and Frank Sloan for the motor winding contest conducted by the club among five of San Diego's high schools' electrical shop classes

School Contest

A realistic and practical touch was given to the electric shop class work in San Diego's five high schools when the Electric Club of San Diego instituted a motor winding contest among the 350 students in those classes. Instructors were asked to select two from each of the ten classes in San Diego, Herbert Hoover, La Jolla, Kearny and Point Loma high schools, according to mechanical ability, interest in electricity, citizenship and scholarship.

At a kickoff luncheon, Sept. 28, each boy was assigned a member of the club as a sponsor, given a General Electric motor kit, instructions and an enthusiastic sendoff on the project. The sponsors will visit their wards at their schools to see how they are doing, sit with them at both the kickoff and award luncheons. Such personal sponsorship is unique and was highly commended by J. Graham Sullivan, director of vocational and adult education for San Diego city schools.

The motors will be judged by a committee of the club and five prizes awarded at the luncheon sometime in December. First prize will be $50, contributed by San Diego Gas & Electric Co. Other prizes are being given by Westinghouse Electric Corp., Allis-Chalmers, Electric Supplies Distributing Co. and others. The entire electrical industry of San Diego is enthusiastic about this practical tie-in with the educational program of the schools.

IES

Electrical Inspector's Day at the Oregon Section meeting of the Illuminating Engineering Society on Dec. 8 was devoted to a panel discussion on code requirements, etc., with Ted Fitch as moderator. Questions were answered by Lou Going, I. B. Sturges, Chris Klawa, and Robert Oster of the Portland city inspection department.

Los Angeles was selected as host city for the 1950 annual Technical Conference of the Illuminating Engineering Society at this year's final session in Boston. At the meeting T. H. Shepherd, illuminating engineer for Los Angeles Department of Water & Power, was elected a regional vice-president of IES.

EMEA

Third annual Industrial Electrical Show of Electrical Maintenance Engineers Assn. of Southern California will be staged at the Shrine Convention Hall in Los Angeles, March 24-26. Space reservations are being taken now . . . Fundamentals of resistance welding were described by W. S. Chapman, district manager of The Denton & Anderson Co., at the Dec. 15 meeting.

EMEA of Northern California heard a discussion on the causes of low power factor presented by W. C. King, Electric Machinery Mfg. Co., Los Angeles, at its Dec. 16 meeting in San Francisco.

IEEDA

On Nov. 15 the Spokane Chapter of Inland Empire Electrical Dealers Assn. elected W. J. Maghan, General Appliance Co., Spokane, as its new president, succeeding John F. Boothe, who is president of the over-all organization. Boothe will serve as delegate at large on the board of governors. Other officers of the Spokane Chapter are Stanley Densow, Densow's, vice-president; Kenneth Hughes, Hughes Electric Co., treasurer; and F. A. Tool, Washington Water Power Co., secretary. Members re-elected to the board include Boothe, Tool, and Jack Poulin, J. Poulin Co. New directors are Dave Cohn, Prudential Distributors Inc., and President Maghan.

Two Idaho Chapters of IEEDA also have chosen this year's new officers. At Lewiston Dewey Scheibe will serve as president; Don Wilfe, Craigmont, Idaho, vice-president; J. J. Fox, Lewiston, secretary; and Harlan Steiner, treasurer. Directors are Melvin Stewart, John Nanninga, Ed Jones and Harold Stoddard.

Claude Whiteley will head the Coeur d'Alene Chapter of IEEDA for the coming year. Serving with him will be John S. McManus, vice-president; G. F. Defoe, secretary-treasurer. Directors are Al Barrett, E. A. Kreg, George Neilsen, R. W. Burch and Earl N. Dawson.

Electric Clubs

Sacramento Electric Club has been appointed the adequate wiring certification agency for the Sacramento area.

Portland Electric Club's principal speaker on Dec. 9 was Harold Singleton, chief engineer, radio station KGW, who discussed the subject of television in Portland.

IEA

Meeting competition on a profitable basis was discussed by H. C. Shoemaker at the November retail board meeting of the Intermountain Electrical Assn. held at the Hotel Utah . . . Election of officers was scheduled for the Dec. 13 board meeting of IEA. Howard W. Price, president, was principal speaker.

ELECTRICAL WEST

1949 Prevue

OUR sincere wish that 1949 will bring progress and prosperity to the electrical industry here in the West can be supported by some facts and trends that make fulfillment possible.

The area continues to hold out attractions to new people. As population grows, so do markets for everything electrical — wired homes, appliances, and electric service. New industries come to serve the growing markets and old industries expand—all with concomitant benefits to every branch of the electrical business.

The tight margin between electrical generating capacity and demand should ease for most sections of the West. New capacity will see to this. Even so, five years of unprecedented construction of new facilities will be necessary to give the whole region a safe power reserve.

Some of the come-easy, go-easy tendencies will be wiped out of the appliance merchandising picture. There is every indication that this business will get back on a competitive basis where good merchandising practices and real salesmanship pay off. But isn't that the best way after all?

The aftermath of the November elections poses some problems. Congress will be more free with public money for power facilities. There could be some restrictive legislation. There certainly will be higher taxes. Under the worst conditions there might be material allocations and some price control. Alert and progressive management can cope with these.

Fourth-round wage increases may come. If they should, then electrical wiring costs may be priced out of the market. And electric rates may have to go up.

Should there be a business recession, we here in the West may never feel the consequences if it is of short duration. The rate at which business currents move from East to West is slow enough to see to that.

For the long-range outlook, we feel certain that prospects were never better for the electrical industry. It is a business of dynamic growth and undeveloped opportunities. Couple that with the assured growth of the West, and you can't help but feel optimistic about the future.

Industry promotional activities, largely dormant since the beginning of the war, should resume. When utilities have extra energy supplies and when customers stop buying everything offered in the way of appliances, then selling starts.

What About Labor Unions?

WHAT can the electrical industry expect in its relations with labor unions in 1949? Modification of the Taft-Hartley act is a certainty. Wage demands may be held down, although fourth-round increases seem assured unless prices drop or there is a real business recession. There will be more pressure for fringe demands. CIO unions will insist that "shortening of weekly work hours, with no cut in take-home pay, security of the worker in his old age, the guaranteed minimum annual wage, adequate sick benefit plans, hospitilization programs and pension plans are all within the scope of collective bargaining." There will be an upsurge in union expansion in those industries and those regions where organizing has been slack. This may apply especially to white collar workers and to supervisors. Labor will try to cooperate more closely with legislators. In electrical plants where the U.E. is the bargaining agency there will likely be more jurisdictional troubles. All of this adds up to a heavy burden for those management men responsible for industrial relations.

Don't Blame the Machine

IT has become fashionable among the pink and deeper red-hued crowd to blame the machine for technological unemployment, depressions and anything else that's handy. But if it were not for the machine a lot of us, including the complainers, would find it hard to make a living. The much maligned machine is supporting by its productivity an army of nonproducers.

Conversion of raw materials into usable products is necessary for the support of our lives and the clothing and housing of all of us. It can either be done by manual work, or the machine can be given the work while men and women steer or operate it. By means of the

EDITORIAL VIEWS

machine the production of eatables and wearables and usables is increased so that all of us can have some. The old manual economy could only supply, and hence support, a relatively few. The machine multiplies those few to millions.

Yes, the machine supports its operators, its designers, its builders, and all of the overhead —which includes the whole distribution fabric of our society, plus the bureaucrats and politicians, plus the charity load, the aged, sick and disabled.

Nothing develops more things for the machine to do than the orneriness of human beings. If the machine displaces man, he has only himself to blame.

TV Troubles

WHILE the advent of television to more and more West Coast cities is proving like a heady wine to distributors and dealers, it is the utilities that are likely to suffer the headaches. The potential troubles for the power suppliers stem from two sources—interference and effect on load.

Television interference for which the utilities will be blamed whether or not they are responsible—is a far more serious problem than radio interference. The black lines, white pips, recurring flashes and picture distortion will make customers far more irate than did the scratches and screeches of radio. Although there is not much that a utility can do about interference until a complaint is received, the experience in one West Coast city may prove helpful. There a cooperative arrangement was perfected by dealers, distributors and utility whereby a field strength test and interference survey was made of each customer's premises before a television set was installed. Thus adverse conditions were determined in advance and customer forewarned. If he still wanted to purchase a set, the responsibility for poor reception rested with him. As a precautionary measure, this program possesses many advantages that recommend its wider adoption.

The other TV problem that may bring headaches is the effect of this new service on the over-all utility load picture. Some utilities in the East are much concerned over the peaks experienced when a championship prize fight or some other popular event is telecast. One company has revised its rates in an attempt to make TV pay its share of peak responsibility. The seriousness of this aspect of TV is questionable.

However, the fact remains that nothing has captured public imagination in recent years to the same extent as has television. Good TV service has definite public relations aspects for the utilities. It is better to be aware of them and plan accordingly than to wake up later with a real headache.

ALTHOUGH many people look upon industrial housekeeping merely as a matter of keeping plants, offices and construction jobsites neat and reasonably clean, the important fact is that such housekeeping reflects orderliness in an organization's affairs from top to bottom. It is my conviction that good housekeeping is as much a product of orderly thinking as it is of broom and dustpan. Orderly planning by management, attended by orderly performance of duties by employees, produces the smooth-working efficiency and the physical neatness that are the hallmarks of good teamwork. There is an old saying—"Accidents don't just happen." Orderliness and safety are boon companions. Mishaps steer clear of workers with neat habits; it is easier to seek out careless employees in unkempt surroundings. Debris and loose tools invite the ambulance. In my travels I have visited hundreds of industrial operations of every nature. It has been my observation that the visible evidences of housekeeping, good or bad, are almost infallible guideposts to the success of the operation. Those with untidy, disorderly appearance have proved to be inefficient and wasteful of time, material and effort. Those with a well-kept look have been the secure, profitable operations producing goods or construction services of high quality with economy.—S. D. Bechtel, president, Bechtel Corporation.

Electrical West—Vol. 102, No. 1

What The Service Station Means

Garth Chamblin
California Electric Service Inc.
San Francisco and Los Angeles

MR. DOE is an unhappy and dissatisfied customer before he comes in our front door. That's why he comes in . . . not to shop and see new gadgets, or to buy something new and shiny for his wife, but to give vent to his dissatisfaction and to get his troubles remedied. He is mad at the factory that made his appliance, he is mad at the dealer who sold it to him, and he is potentially mad at us because we are unfortunate enough to have anything to do with the line. He just paid good money for it and it won't work. Why did he have to get a lemon?

The service station, by its attitude and service, can either resell Mr. Doe on the appliance he purchased, and the factory behind it, or can still further irritate him so that he will advertise to the world that a "Crumbmaster" toaster is just no good. Full page ads in the leading magazines won't convince his neighbors that Mr. Doe just happened to get a bad one. He'll tell them plenty, and in a convincing way too.

However, the service station cannot do the proper reselling job alone. It must have the active cooperation of both the factory and its local representative.

The indifferent representative never shows his face to his local service station until Blatz Bros. (one of his better customers) complains that the same percolator has been sent in three times for service and still isn't right. Then he comes in with blood in his eye and wants to know why the blankety-blank we can't make this percolator work the first time. Chances are the percolator is O. K. . . . the trouble is in the customer's cord which they forgot to send in. That slows him down a bit, but he's still not happy. He doesn't see or even hear about the hundreds of other percolators that have been satisfactorily repaired to make his selling job easier for him.

Other factory representatives call on their service stations regularly, are advised of current problems, assist in expediting parts orders from the factories, advise the service stations of new models coming and quantities sold in their territory, etc., etc. These representatives, instead of deriding the service station to their customers when service is slow or other troubles occur, often know the answer to the problem on the spot, and can therefore give their customers an intelligent and satisfactory answer, and at the same time pour some oil on the rough water. These representatives build up the service station in the eyes of their customers by assuring them that their respective factories have the finest service station in the area. Sure . . . we make mistakes. The service station is a human institution, and what company doesn't? But, it doesn't make the representative's customer feel any better to hear him say, "Yes, their service is always slow . . . I don't know what's the matter with that outfit," when there is more than likely a very good reason for the delay which he would know about, if he would only take the trouble to find out.

Some factories apparently appoint service stations because they find selling difficult if not impossible without them, and then proceed to forget they exist. They drive as hard a bargain as possible on the reimbursement for in-guarantee repairs, and are entirely oblivious to every-day service station problems. The only time we hear from these factories is when we get a letter saying, "You charged Mrs. Jones $4 for repairing her clock . . . how come?" The first time we ever hear about that new model P-789 waffle iron is when a customer brings one in with a broken handle, and then says, "What . . . you have no new handles?" Then, four weeks later, when the handles arrive from the factory, we have to figure out for ourselves which screws to take out and what clips to bend to get the new handle installed in the most expeditious manner. In setting in-guarantee rates, these factories put an appliance on a workbench, give Joe Spivis (their best factory man) a thermostat, and then put a stopwatch on him while he installs the thermostat. Twenty minutes work and Joe gets $1.50 per hour, so that's 50c cost per item. Of course, the service station should be willing to perform this in-guarantee work at cost because there is so much "gravy" in the other repair work.

These factories have lost sight of the fact that our "Joe" must first diagnose the trouble, and that, for each two "Joes" at the workbench, there is at least one counter clerk, stock man, shipping clerk, or biller. They have overlooked items of rent, insurance, telephone, bookkeeping, taxes, etc., all of which are part of cost. Furthermore, since the war, as the market has gradually become flooded with new appliances, the percentage of in-guarantee repairs has increased until on some lines it is as high as 80% of the total repair volume. What business can operate without profit (or at a loss) on 80% of its volume? Why should a manufacturer ask a service station to do one-half or more of its work at cost, any more than they would ask a retailer to sell one-half of his merchandise at cost? Where lies the "gravy" on the chargeable work that can carry this load? There isn't an item sold or a repair job done by a service station that carries any more, if as much, gross profit as is required and demanded by the average retail store.

If Mrs. Jones has to walk through some dark alley and up a dingy stairway to be confronted with a greasy-handed mechanic in a sloppy workshop when her toaster requires adjusting, such a service station certainly has not contributed to her confidence in the manufacturer, or her pleasure in owning the toaster. And yet we venture to say that there are service stations all over the country, in which a factory man has never set foot.

Fortunately, the realization is dawning on the most progressive manufacturers, that here lies one of the most important phases of customer relations, and that their service stations are an integral part of their own organizations, so far as the general public is concerned. These factories have sent men to appraise the service station as to location, general appearance, personnel, management, etc., and to consult and advise on service problems. They have compiled complete parts catalogs, service manuals and other literature, and have promptly advised of new models or changes in manufacture. Most important, they have set in-guarantee labor allowances which will enable the service station to make a fair, legitimate profit on the work performed, and are receptive to changes in rates or other policy as it becomes necessary.

It is our contention that the manufacturer, his local representative and the service station are a "team" to sell and *keep sold* the manufacturer's

products. Perhaps some service organizations have lost sight of this fact, but it is no less true that some manufacturers and their representatives have placed altogether too little importance on the service station's role as a member of this team.

To the factory representative we would say, get acquainted with your service station. Familiarize yourself with their problems and give them advice and assistance whenever possible. Don't wait until your best customer is mad at them. Drop in once in a while anyway, because you will probably find they are willing to go more than half way to keep your customers happy. Remember . . . they are a part of your team.

To the factories we say: "First ask yourselves what kind of service representation do you want? Do you want a tinkerer in the basement of his home on the outskirts of the town, or a grease-monkey on the second floor up some dark alley? Or do you want a centrally located, clean, up-to-date, business-like organization of which you can be proud?"

If the answer to this question is the latter, then when you set up your budget for advertising, commissions, etc., provide a percentage for service which will definitely assure a healthy financial condition for your service stations. No business can do a good job or present a front that you will take pride in sending your customers to, if it is struggling to make ends meet.

Visit your service stations regularly. Keep in close contact with them. Give their parts orders top priority, and advise them of changes in manufacture, new models, etc., before they get into the hands of your customers. Give them all the cooperation possible. Remember . . . *they are a part of your team.*

Light Sorcery

Alston Rodgers, casual, witty showman for General Electric lamp department, Nela Park, once upon a time of the Los Angeles division, returned West during November to bring *Light Sorcery* to audiences of public, school children, lamp agents and dealers, General Electric employees, IES and AIEE and similar groups in a series of one-night stands and matinees. Seldom has the parade of light sources available today been presented or reviewed more entertainingly than Rodgers and gadgets did on this tour.

Amplifying his own voice with a concealed short-wave broadcasting set under his coat, Rodgers covered the light course spectrum from infrared to ultraviolet, from Edison's hairpin in a bottle to fluorescent and flash lamps. He demonstrated most of the lamps he spoke about in novel ways from a stage set up to look like a magician's act. It *was* magic but all of it thoroughly accounted for by science and Rodgers.

The *Light Sorcery* show was given by Rodgers at Spokane, Yakima, Seattle, Tacoma, Portland, Klamath Falls, Sacramento, Oakland, San Francisco, San Jose, Santa Cruz, Fresno, Los Angeles, Pasadena, San Bernardino, San Diego, Phoenix and Tucson. The show started with James Jensen of the engineering division at Nela Park, first touring the East and reaching Pueblo, Colo., in October. Jensen took it to Denver, Salt Lake City, Boise, Butte and Missoula. Rodgers picked it up at Spokane for the rest of the Western tour.

● As A Means of publicizing its big sales of lighting fixtures, Sunbeam Lighting Co., Los Angeles, circulates a direct-mail piece which it calls "Sunbeam Lighting Co. Job of the Month." On it is a calendar of the year with the particular month in color. The mailing piece carries an architect's drawing of the building and below it are shown pictures of the type of fixture sold to the job. Architect, general contractor, electrical engineer and electrical contractor are named. Publicity is prepared by Murray-Dymock Inc., advertising agency.

The "Go-All-Electric" idea extends to restaurants in the Rocky Mountain region where Rocky Mountain Electrical League is pushing this program and local utilities are backing it up. Long's Peak Cafe, at 920 Eighth Ave., Greeley, Colo., the town's newest and most modern cafe, operates 24 hours per day, serving 30,000 customers each 25-day month. It is equipped with a fry kettle, two 4-slice toasters, an 8-ft. hot food server, two heavy-duty waffle irons, a bun warmer, a heavy-duty mixer, a slicing machine, a 6x10-ft. walk-in refrigerator, a freezer cabinet of 20 cu. ft. capacity, three refrigerated fountains for drinking water, an 8-ft. section griddle, two restaurant-type ranges, a glass washer, and three refrigerated back bar sections, plus a number of small counter appliances. Equipment has a 40-kw. demand, and the restaurant is air conditioned and fluorescent lighted and is very popular in Greeley

Hawaiian Electric's "Hana Nanea" auditorium platform kitchen. At right, Helen Cartwright, Erma Meeks, model miniature

IT'S TOPS IN THE HOME SERVICE

"HANA nanea," which means "work of such absorbing interest that it becomes play," is the name given to the new demonstration kitchen auditorium in Hawaii that is the center of the most modern and complete home service department in any Western utility. Most of the second floor of Hawaiian Electric Co. has been transformed into this department, presided over by Erma E. Meeks, home service director, and her staff of eight attractive and accomplished girls.

Formerly in smaller quarters on the fourth floor, the new second floor location is more accessible as well as roomy. It centers around the demonstration kitchen and auditorium which seats 150 and can crowd in 200. It is equipped with air conditioning, sound system, mirror over demonstration area, movies, and concealed spot lighting. Oak cabinets along the sides keep literature, posters, etc. At the auditorium rear are two model electric laundry set-ups, one Westinghouse, the other Hotpoint. Kitchen on the stage has 220-volt receptacles so that ranges of all makes from local dealers can be demonstrated.

"Hana Mikioi," an "efficiency kitchen" separate from the auditorium, is used for recipe testing and meal preparation. It is a kind of kitchen laboratory of about normal kitchen size. The director, Erma Meeks, has an attractive modern office as well. In the two corridors on each side of the auditorium are Hotpoint and Westinghouse displays of appliances which the company itself sells. The department, however, endeavors to demonstrate all makes in cooperation with local distributors and dealers.

C. E. Nolan, vice-president and promotional manager, says it took a year to plan and to install the new department quarters. Hawaiian Electric instituted its first home service department 22 years ago and it has grown in size and importance each year. Erma Meeks tells of classes of homemakers of all races who come and who contribute food ideas and recipes from all the nations of the world.

Activities of the department are comprehensive. Reddy Kilowatt cooking classes are held weekly for homemakers. Youngsters have programs of cooking and demonstrations of appliance use. Home economists present programs to women's clubs. Dealers and their sales people are given sales training classes. A film library is maintained for use in meetings and clubs and in sales training.

Home calls are made to practically every purchaser of a new major appliance sold either by dealers or the company. Dealers are given quantity buying advice cards to give to prospects and they report sales so that the dealer's customer may be given intimate home call information on proper use and care of newly purchased equipment. Kitchen planning is done for those requesting it. One of the girls, Margaret Jean Bolte, is at Nela Park, Cleveland, taking instruction to bring the latest and best practices in home lighting to the Hawaiian Island homemakers.

Home service staff—top row: Marian Arnott, Kathryn Robbins, Erma Meeks, director, Helen Cartwright, Ruby Willey. Lower row: Margaret Jean Bolte, Hortense Clifford, Erma Richards, Yuki Shigeura, who recently resigned and whose place is now filled by Mew Lun Hee; all are graduate home economists

ELECTRICAL WEST

Sales Guide

News Letter

FOR THE ELECTRICAL MERCHANT OF THE WEST

January 1949 ©

Gleaned from our Washington News Bureau are some straws that tell where the wind (no offense meant at Congress) is headed. Strictly not predictions, but just common sense. Federal Reserve Board thinks inflation is getting weaker. Taxes just have to go up to pay for all the social programs. Ways will be sought not to tax small personal incomes or small business too hard, for that's where most votes are, but to sock the big profits, if any. That delivered price problem isn't likely to be solved soon for a lot of opposition has cropped up. Congressman Patman wants a law to require sellers to disclose completely the details of all the discounts they give and wants to stop chain stores from deducting losses from below-cost sales to eliminate competitors.

Weather vane

McGraw Electric now owns not only Toastmaster but Manning-Bowman and Bersted which had formerly been merged. Makes this the biggest small appliance combination in the business, with McGraw Electric making toasters, food warmers and water heaters (one plant in Azusa, Calif.) as well as Fusetrons and Fustats, Manning Bowman making the quality line of table appliances and table ware, and Bersted the moderate priced line. Each unit will continue as separate entities, says Max McGraw, without change in sales policies.

Big in the small

Hotpoint will spring a totally new automatic washer of its own, priced in "the middle bracket," made in its own factories and different in principles and control from the parent G-E model.

Its own

Westinghouse's J. H. Ashbaugh, v-p of the appliance division, in a year-end statement said inventories were low and so there are no cutbacks in production. Allocation should end this year, he said, and prices remain the same.

Even keel

When Apex shut down its washing machine plant recently, having filled the year's orders, it caused lots of speculation. Old washer men recalled, though, that it was a prewar pattern. Apex makes washers for big chain outlets. When it filled their order backlog it had stock piled for its own sales too. Spring will bring back production, it was predicted.

Seasonal pattern

Coolerator will have a line of electric ranges in '49 too. Will have three models, four refrigerators and two freezers. Will compete with its parent, Gibson, in the range game. Has color sound slide film sales training aids.

Hot and cold

Steam up

Proctor has entered the electric blanket field, as you may have noticed. Expects to bring out a new steam iron early this year. No waffle makers on the list just yet. Irons, toasters, roasters and the cord-minder were the last year's line.

Hot glass

When radiant glass heating broke out in a Life story inquiries poured in here at our office for information about it. It came out as Infra-Lectric about two years ago but not much was done about it. It is made by Continental Radiant Glass Heating Corp. with factory at Port Washington, Long Island. Will market panels through Radiant Glass Heating Corp. through builders' supplier outlets. Appliances will be portable heaters, low cost clothes dryer, hot-plate and tray and others.

Changes job

B. C. Electric lost one of its long-time employees when Bill Bitcon (with the utility for 14 years) resigned as supervisor of dealer services to take over a new job as representative in British Columbia and Alberta for John Inglis Co. Jim Skelton succeeds Bitcon at B. C. Electric.

TV news

Television boomed Christmas sales in Seattle and San Francisco. Reaction of the public was generally fine. KPIX in San Francisco put out test patterns Dec. 17 and was received with surprising clarity even as far away as Monterey and Sacramento. Hills of the bay region weren't impeding as much as expected. KPIX made a deal to take NBC program material temporarily until its own affiliate finishes its station. . . Telephone company is making surprising progress in erecting relay stations between Los Angeles and San Francisco. Has coaxial cable from the latter to Portland. Will spot relays across to Salt Lake City next year so the West will have a network perhaps by the end of the year. . . Radio Manufacturers Assn. has asked FCC to adopt a two-band system to clear the way for unfreezing channels already assigned, such as in San Diego. Claims it would prevent obsolescence of sets and promote development. Urges VHF in cities, UHF in smaller cities to prevent overlap.

And products

Bendix Radio has introduced an antennaless radio-television set with a 52-in. projection screen. First showings have been in Eastern Cities. . . Hallicrafters is making a private brand TV set for Macy's called Artone. Other Affiliated Retailers Inc. stores like May's in Denver may have it too. Will sell at about $250 with 10-in. screen.

Home econ training

Electrical Living Institutes, for which home economics teachers and students will receive in-service increment credit and also college credit, sponsored by the Pacific Coast Electrical Assn., Northern California Electrical Bureau, Pacific Gas and Electric Co., and San Francisco public schools, start at PG and E auditorium Jan. 26 for 15 two-hour classes between 7 and 9 p.m. They are the outgrowth of the two-day home economics workshops in Los Angeles and San Francisco last year. Marguerite Fenner, PG and E home economics director and chairman of the PCEA committee has sparked the program. Similar institutes are to be held in Los Angeles and San Diego later.

Sales control

Inland Empire Electrical Dealers Assn. is urging support of a bill in the Washington state legislature to require that appliances sold in that state be made according to approved safety standards. The bill carries provision for registration of retailers and fee of $2 for administration and enforcement. Maintains that Washington and Idaho have been dumping ground for substandard and often unsafe appliances.

Goings on in January which will be reported on next month--Big San Diego winter conference of Bureau of Radio & Electrical Appliances, Jan. 19, from 12 noon to 10 p.m. with 18 events in rapid fire style. A tremendous shot of sales stimulant and information in one highly concentrated capsule. . . Start of the Northern California Electrical Bureau second round of sales training classes on ranges, water heaters, refrigerator and home laundry--an advanced course for those who took the basic training last year. . . National Appliance and Radio Dealers Assn. annual convention at Sheratorn Hotel, Chicago, during market time, Jan. 9. Formerly called NERA, this convention will be presided over by Herb Names of Denver, president. Simon Halle of Colorado Springs and Phil Urner, Bakersfield and John Gillivan, Oakland, are on the program. . . And of course the month ends with the West's own big Market week at Western Merchandise Mart, San Francisco, Jan. 31-Feb. 4, with the appliance trade dinner, Wed. Feb. 2, at which H. G. Bonfig, Zenith v-p, will be featured.

Start the new year

Leroy Bennett, former Monitor distributor and before the war G-E appliance distributor in San Francisco, has been named director of activities for the Northern California Electrical Bureau.

Named

Pacific Gas and Electric Co. will act as a "clearing house" for the recording of television sales made by San Francisco retailers. Local TV stations KPIX, KGO-TV, and KRON will be provided with names and addresses of television users enabling the stations to keep set owners informed of programs, distribute program listings and conduct popularity studies. Information will be held confidential by the television broadcasters.

TV clearing house

Zenith television models were unveiled before 600 southern California dealers late in December with Sues, Young & Brown, Zenith distributors in the Los Angeles area, as hosts. Instead of the conventional rectangular picture the new Zeniths feature a luminized circular screen, and "Bulls Eye" automatic tuner. Zenith TV line includes nine models--two table, four console, and three console combinations including TV, FM and AM radio, and a silent speed record changer with twin Cobra tone arms for regular and LP records.

Video showing

Stewart-Warner radio and television set production and distribution will be handled by a newly-created division of the firm to be known as Stewart-Warner Electric Division.

Separate division

The 1949 model Launderall features a new outside appearance and major mechanical changes, says the F. L. Jacobs Co. Changes include redesigning of the control panel and its starting switch, safety door handle, and water temperature control. A two-gallon spray rinse has been added to the machine's washing cycle. An ElectroCycle power unit controls the washing cycle.

Innovations

To meet customer preference Hoffman Radio Corp., Los Angeles, will produce its combination TV radio-phonograph and radio-phonograph sets with long-playing record changers as optional equipment, says H. Leslie Hoffman, president.

Optional

Central Arizona Light & Power Co. has reentered the sales promotional field after almost eight years of inactivity, Don Willis, general sales manager, has announced. Utility will soon sponsor a lighting campaign, according to Bert Smith, recently appointed manager of sales promotion and advertising in the general sales department, who will direct the sales activities.

Back again

Ruling is that sales tax must be paid on television installation charges. So be sure to protect yourself by collecting the tax when you sell a TV set which includes installation charges. — It's the law

Admiral has made arrangements for a nation-wide financing agreement with 300 local offices of Commercial Credit Corp. to take care of installment sales of its products through all Admiral dealers. — Budget buying

Yale & Towne announces that it has suspended the manufacture of its Tip-Toe iron. The action will not affect other operating divisions of the company, executives said. — Discontinues iron

O. B. Wilt Co., Western Merchandise Mart, San Francisco, has been appointed manufacturers representative on the West Coast for the new Economaster dual purpose electric range and water heater manufactured by Economaster Sales Inc., Nashville, Tenn. — Coast rep.

Western Merchandise Exhibitors Assn. has changed its San Francisco Spring Show dates to Feb. 6 through 9, 1949. The show, formerly scheduled to include Feb. 10, was cut short to accommodate exhibitors planning to attend the Seattle Show which follows. — Dates changed

American Fair Trade Council has published a useful book entitled "A Practical Guide to Fair Trade Laws," available from the Council at a price of $2.50. — Fair trade

W. W. Welch Co. is now selling its line of Air-Flight circulators exclusively through wholesalers and distributors, eliminating its former plan of direct-to-dealer sales. There will be no change in price and discount structure to dealers, says its president W. W. Welch. — New plan

A five-year warranty from date of consumer purchase is being offered on the drive-transmission of the Apex Wash-a-Matic. This guarantee is in addition to the one-year warranty of the entire washer. — Five-year plan

Two West Coast salesmen were awarded cash prizes in a recent two-month sales performance contest sponsored by Mullins Mfg. Corp. for its electric garbage disposer. Of the five top winners C. L. VanHorn of S. J. Peters & Sons, San Jose, placed fourth; and Lloyd H. Palmer of Barker Bros., Los Angeles, placed fifth. — Winners

Colberg Supplies, San Francisco, recently appointed distributor for Tele-King Television, has opened a display room at the Western Merchandise Mart. — Display space

T. N. Biglieri has joined the sales staff of Kaemper-Barrett, San Francisco. He will represent Admiral refrigerators, radios, television and electric ranges in the Bay area. — Joins staff

Hotpoint has provided its dealers with a new dishwasher sales promotion plan book telling how to use a dishwasher demonstration package, a national advertising reprint holder, direct mail plan, suggested displays, contest ideas and newspaper advertisements. — Selling guide

Westclox plan to start national advertising on its new electric clocks, Moonbeam and Switch Clock early in the spring. Main feature of the Moonbeam is its blinking light. In case the blinking doesn't do the trick in the morning a conventional type alarm goes off. . . The Switch Clock is designed for automatically turning on and off appliances. — Time flashes

ELECTRICAL WEST

Sales Guide

FOR THE ELECTRICAL MERCHANT OF THE WEST © JANUARY, 1949

Is This It?

STARTING the New Year—1949—there is another kind of inventory to take. Not alone the stock on hand, but to take stock of the situation in hand. For it appears that the corner everyone talked about was turned somewhere just before Christmas. That time everyone preached about has come—the time to dig in and **sell.**

Unless you are a sales genius, and very few are, preparedness for selling is smart thinking. And not too difficult either. It falls into about three groups of things to do:

Get yourself organized so that you know what you need to know about (1) the **products** you sell, (2) the **services** you render, and (3) **your** market.

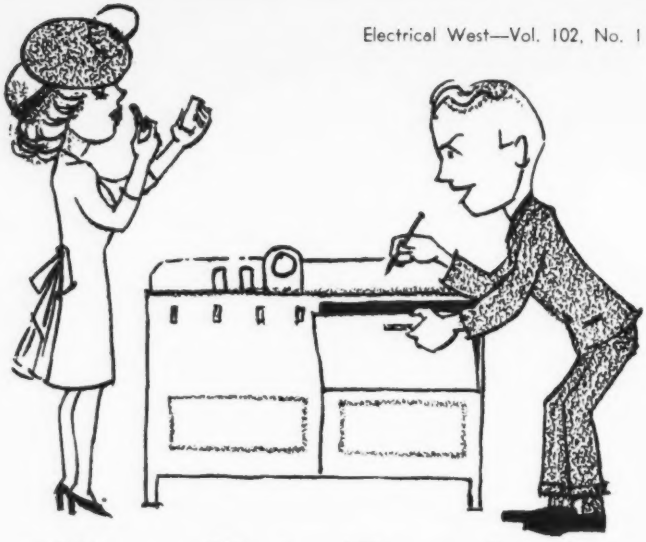
1. **Look at your products from the eyes of your possible customers.** What will they do for them, how serve them, what benefits or advantages will they derive from using them. Make yourself a simple, useful list of these points about each appliance.

2. Appraise the value to the **customer** of **the services you have to offer.** Never mind what they represent to you or the business. Think of them from the **user's** standpoint so that you can talk in his or her terms about it.

3. **Your market** is the **people** in your town and neighborhood, not some theoretical bunch of mathematical figures. Think of them as the individuals they are, the way they live, what they have and what they need, their ability to buy and pay, their views on style and preference, their habits and ways. It is **real people** who buy and real people to whom you must sell. And to sell them and keep in business you must benefit them by selling them the things you have for them. It is as simple as that.

A new series for a New Year

by
Ken Hampton



When Competition Gets Tough they say—

To stay in business you must be loved. That is a central thought. Behind this whole group of articles published in Electrical West we have been striving to show that sound merchandising consists of pleasing people. To be successful, the electrical dealer must please people both in his buying and selling, then they will become both customers and boosters for his wares.

Good merchandising is the process of pleasing people at a profit when they come to your store seeking information about the goods you have for sale. People want to feel that your store is run by their kind of people in a way they like. For example: they want to think, "That store is going my way." They also want to deal with a leader. They want to be proud of your firm—they want to say "That store is well run—it has good leadership."

They want to deal with a growing business that has an eye on the future. Identify yourself with the activities in your town that build for the good will of its citizens and the sound growth of its character-building organizations. Their personal life is one of development and seeking to improve their home and they want to deal with a store that they think has a similar policy. They want to say, "If it is available, this store will have it—it keeps up-to-date."

They want, too, a hopeful outlook. They believe in a business that is building for a better tomorrow. There is enough bad news in the world without your adding pessimism of the wares you sell in your store. They want to say, "If I buy this electrical appliance from this store, life will be better for me."

Your store, to be most successful, must be run from beginning to end for **people**—all merchandise should be offered in terms of the solution of people's problems. Show it and sell it in the terms of furthering people's hopes and desires and you will find many new customers seeking you out and your old customers coming back more often.

People like cleanliness and order and friendliness—they respond to a courteous greeting and an honest attitude. They want to say, "The people in this store are pleasant—I like them."

Strive to conduct your store so people will say, "My kind of people run this store—it is run by courteous people who know their business—they are willing to listen to my problems and help solve my needs. They sell good merchandise. I feel good when I buy from them because they always help me solve my problems the best way for me." People who speak of you like that are tough for competition to ever woo away . . . To meet competition best, conduct your store in such a way that you are loved by your customers.

NO SHORTAGES OF ACTIVITIES

in Inland Empire, whether steel and power are scarce or not

ALTHOUGH demand and sales volume in the Inland Empire were higher than expected, appliance dealers faced two big problems of shortages. A short supply of steel would probably cause merchandise shortages for about a year, and the power shortage in the Northwest might affect appliance sales. These conclusions were drawn at a series of general membership meetings of the six chapters of the Inland Empire Electrical Dealers Assn. in November.

Thomas H. Ryan, Seattle, newly appointed Northwest district manager of the Coolerator Co., presented his views on the merchandise supply situation before 200 electrical dealers, wholesalers, and contractors at a joint meeting of the Spokane and Coeur d'Alene chapters in Spokane. J. E. E. Royer, vice-president and general manager of the Washington Water Power Co., reported on the power supply situation in the Pacific Northwest at the same meeting. Reviews of their talks were given at other chapter meetings later in the month.

High steel prices, gray markets, and shortages of consumer goods have been caused by the fact that steel production facilities were not expanded to meet the postwar market, Ryan said. However, the steel industry is now engaged in an expansion program which will greatly increase the supply of steel used in appliances. This program will take from nine months to a year, he estimated, but at that time appliances should be plentiful.

The expansion of steel production facilities is not likely to have an early effect on appliance prices, Ryan predicted. The cost of amortizing the tremendous investment being made in new equipment will prevent major reductions in steel prices.

The decision of steel producers to expand at this time is a very hopeful sign for the electrical industry, Ryan said, because the expansion is directed primarily toward increasing production of steel for appliances rather than for armaments, automobiles and other products fabricated from steel.

Another shortage, that of power in the Northwest, was discussed by J. E. E. Royer, who outlined the reasons for the present power shortage and explained the necessity of conservation to help the Northwest Power Pool over the daily peak.

Shortages didn't enter the picture, however, when the activities of the IEEDA were reported at the series of meetings. W. J. Maghan, chairman of the membership committee of the Spokane chapter, stated that 64 new members had joined the association since the November 1947 meeting.

F. A. Tool, secretary of the IEEDA board of governors and chairman of the committee, discussed the promotional activities of the organization. One project that promises success is the consumer research and education program, he said. The association, with the help of the Spokane Federation of Women's Organizations, is sponsoring a series of demonstration meetings at which homemakers hear panel discussions and see demonstrations of various appliances.

The first major project of the consumer group, said Tool, was the study of home freezers. Association members installed freezers in the homes of two Consumer Bureau members, who used them for two months in advance of the general meeting of the club women, and then reported on the results of their experiments with various types of foods at the demonstration meeting.

In Tool's report on other association activities, he mentioned such projects as the co-sponsorship by IEEDA of National Home Week in Spokane, the successful completion of a series of public electrical industry meetings sponsored jointly by the association and the Washington Water Power Co. to promote adequate wiring, and plans to organize an electric show to be held in conjunction with the Spokane Home Show in the spring of 1949.

Paul Heydon, chairman of the IEEDA legislative committee, reported on the work of his committee in drafting and sponsoring a bill which would require safety standards for electrical merchandise sold at retail and provide other public protection. The bill will be introduced at the forthcoming legislative sessions of Washington and Idaho.

Other accomplishments of the association were reviewed by Robert L. Wilkinson, executive secretary. He outlined such projects as the monthly *News Letter*, with information on market conditions and management techniques; periodic research studies, including a study last year of comparative costs of LP gas and electricity for cooking and water heating and a contemplated study of the outlook for television broadcasting and retailing in the Inland Empire; periodic cost ratio studies, the IEEDA Salesmen Selection Bureau, and plans for a three-day course in fundamental sales-

Northwest power shortage and the importance of conserving power to help the Northwest Power Pool over the daily peak were problems discussed by J. E. E. Royer, vice-president and general manager of the Washington Water Power Co., who was a featured speaker at the IEEDA membership meeting in Spokane last month. IEEDA President John Boothe is seated at left

Roy Davis, a radio parts wholesaler turned rancher, found other ranchers needing all sorts of electrical supplies. So he converted an old bus to a traveling store to carry appliances and wiring supplies direct to the farms of San Diego County. He built bins along one side to which fittings are attached for visual display. He calls on his farmer customers at regular intervals and makes friends and also good business for his traveling store

manship to be held next spring.

Association President John F. Boothe reported on the over-all activities of the organization in giving individual members assistance in selling more merchandise at lower costs and in promoting harmony and cooperative effort by all industry segments to sell more of the industry's goods and services.

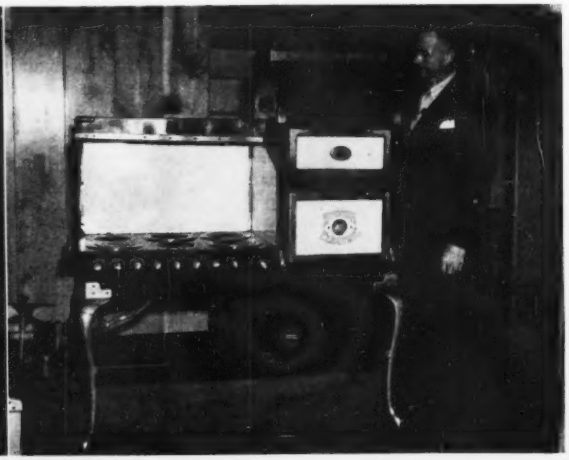
Boothe described the benefits which have already resulted and the additional benefits which will come from education, interchange of ideas, personal contacts with other industry members, massing of effort, building of public good will and confidence in the electrical industry and attention to the long-range market.

● Evidence that improvement is being made along many fronts in the damaged-in-transit situation reported by Electrical West in two articles recently. Since that time shippers, transportation companies, packaging materials suppliers and others have called attention to improved conditions. From Westinghouse comes word that its R. F. Bisbee, manager of the quality control department, has been appointed chairman of a packing and shipping committee of the Porcelain Institute. Its purpose is to study ways in which to reduce damage to porcelain products in shipping.

Old Range Pays Dividends

Oh to have a dilapidated electric stove—say vintage 1916. It pays dividends, as Dr. Albert O. Holmes, 1218 Wellington St., Oakland, found out.

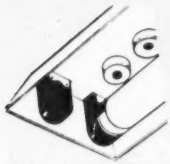
When Capwell, Sullivan & Furth, Oakland, announced its "Oldest Electric Stove Contest" for residents of Alameda and Contra Costa counties, Dr. Holmes decided to compete with his 1916 Hughes model, made by Hughes Electric and Heating Co., grandfather of Hotpoint. Among the 31 entries none could match his ancient looking appliance. For the oldest range of a brand still being manufactured and in operation since being installed, Capwell, Sullivan & Furth presented Dr. Holmes with the big prize—a new 1948 deluxe Westinghouse range.



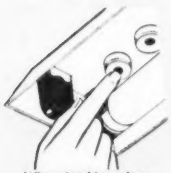
G-E Watch Dog REG. U.S. PAT. OFF. STARTERS

SAVE COSTS, TIME, LABOR, EYESTRAIN!

When lamp dies, the Watch Dog cuts it out of the circuit.



Manual reset button "pops" out when the lamp fails.



When dead lamp is removed, starter is reset by pushing button in.

New lamp inserted in holder immediately begins to operate.

SAVE COST! The G-E Watch Dog preheats electrodes within a measured time, prolonging lamp life by preventing unnecessary discharge of emission material. By cutting itself out of the circuit whenever a lamp is about to die, the Watch Dog prolongs life of the ballast and of itself, whereas ordinary starters, in trying to relight a dead lamp, naturally subject both starter and ballast to unnecessary heating and stress.

SAVE TIME! Because G-E Watch Dog starters automatically cut a dead lamp out of the circuit and do not attempt to relight it, they have exceptionally long lives — approximately 25,000 hours. One Watch Dog outlasts five ordinary starters — thus saving considerable replacement time.

SAVE LABOR! By eliminating frequent starter replacements, G-E Watch Dogs reduce maintenance to the simple job of pushing a button before relamping.

SAVE EYESTRAIN! The G-E Watch Dog prevents blinking and flickering of dead lamps, so annoying and harmful to eyesight, so costly in current consumption, ballast and starter life.

ALWAYS SPECIFY G-E WATCH DOGS: FS-20 for 15 and 20-watt lamps, FS-30 for 30-watt, FS-40 for 40-watt, FS-100 for 100-watt with 4 contacts, FS-102 for 100 watt with 2 contacts.

Replace a Watch Dog with a Watch Dog!

GENERAL ELECTRIC SUPPLY CORPORATION

SAN FRANCISCO • OAKLAND • SACRAMENTO • FRESNO • LOS ANGELES
SAN DIEGO • PHOENIX • SEATTLE • PORTLAND • TACOMA • SPOKANE

APPLIANCE PREVIEW

Bed Lamp (147)

The new Mitchell Spotray bed lamp has a convex lens that throws a concentrated beam of light on the reading surface and leaves the rest of the room dark. Ventilated construction, incorporating a ½-in. air space around the main housing, keeps the outer housing from getting uncomfortably warm. Four models in the line include a clamp-on type for conventional headboards, a Hollywood bed model that fastens to bed frame, a bed stand model and a twin-bed model with two lights.

Cleaner (148)

A light-duty, hand-type cleaner for stores, offices, repair and service shops and light factory jobs has been added to the ideal line. A blower nozzle is furnished as standard; other attachments are available to permit vacuuming, spraying and drying. This cleaner has a ½-hp., continuous-duty universal-type motor with permanently sealed ball bearings. Air velocity at the blowing nozzle is 18,000 ft. per minute. Suction air volume (1½-in. hose) is 120 cu. ft. per minute. Waterlift is 28 in. Weight, 8¼ lb. without 20-ft. cord.

Clocks (149)

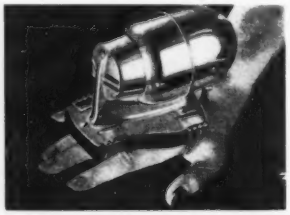
Flush-type electric clocks for kitchen and office are offered by Harley's Clock Shops. They mount on the wall, with only characters and hands projecting; have self-starting Hansen Synchron electric movement, 3-year guarantee. No. 201 is stainless steel, with 8-in. square faceplate and choice of red, blue, green, black or yellow decalcomania numerals with sweep second hand to match. No. 202 has dial of raised and lacquered brass studs on an 8-in. faceplate of 14-gage stainless steel. No. 202S comes with silver-plated studs. No. 203 has 12x11-in. aluminum faceplate with modern characters of satin alumilited aluminum. Background may be painted and characters will stand out on the wall.

Kitchen F Units (150)

Eight- and 15-watt fluorescent fixtures for installation under kitchen cabinets to flood work areas with indirect light have been announced by Guardian Light Co. Knock outs for permanent installation or cord and plug for portable installation are provided. Both sizes can be furnished with one or two standard convenience outlets.

Vibrator (151)

A. C. Gilbert Co. is making an improved model of its electric vibrator on the market before the war. Called the Vitalator, this machine is said to give the pulsating Swedish-type massage. It fits on the back of the hand and is held by two flexible spring straps that slip over the fingers. Power is supplied by a Gilbert Universal motor operating on 110/120 volts, a-c or d-c, 60 cycles or less. Finish is light blue-grey.



Floor Polisher (152)

A floor polisher offered by S. C. Johnson & Son comes in Cherokee red, has air-cooled 3,000-r.p.m. motor operating on a-c or d-c, 110/120 volts. Furnished with 22¼-ft. rubber covered cord, molded plastic plug.

Kitchen Fan (153)

Westinghouse has a new 10-in. kitchen ventilating fan, claimed to move 450 cu. ft. of air per minute, sufficient to give a 9x12x8 kitchen a new supply of air every two minutes.

Washer (154)

Appliance Mfg. Co. is offering Model 5LS Duchess washer as a lower-priced model in its line. It has 6-sheet capacity with standard 22-in. tub, 16 gal. to the water line. Motor-driven drain pump may be secured at additional cost.

Cord Sets (155)

Bell Electric has developed a line of extension cord sets, table taps and current taps incorporating safety features of its No-Shok duplex receptacle. Feature is a rotating cap that snaps back to cover prong slots when plug is withdrawn. Available in brown or ivory and with 6, 9, 12 or 15 ft. No. 18 POSJ rubber-covered cord and molded rubber plug, table tap for use with cord set and current tap for extra outlets.

Water Heater (156)

An electric water heater designed to fit between range and sink and to match standard kitchen equipment is offered by Wesix. Storage capacity is 50 gal. Unit has 3 in. of insulation on all sides.

ELECTRICAL WEST, 68 Post St., San Francisco 4, California
Please send me information about following CIRCLED items:

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Name ..... Company* ..... Title* .....

Address .....

* Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

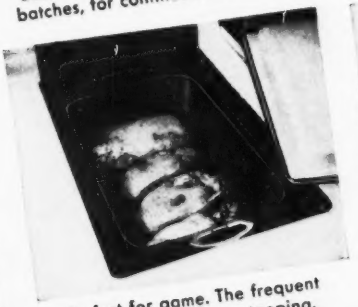
Increase your '49 sales with the Monarch Stoopless Surface Oven!

A made-to-order unit for cooking "New England" dinners.

Bake cookies oftener, in smaller batches, for continuous freshness.

Handy for baking biscuits in a hurry. Saves using the large oven.

Baked beans remain whole, not mushy.



Perfect for game. The frequent basting requires no stooping.

Makes an ideal "steam-table-server." Keeps meat warm without drying.

Here's just about as beautiful a sales story as any range salesman can park in his kit! And just about as beautiful a cooking convenience as any woman can put in her kitchen. *Range top baking in the Monarch STOOPLESS oven!* Lift the cover and there's the food. Vegetable dinners, cookies, biscuits, beans, game, roasts, ham — practically anything on the daily menu. Yes, indeed, if you've got your sights set on increased sales for 1949, here's the range that will do it!

Monarch Malleable Range Co., 3929 Lake St., Beaver Dam, Wis.

Monarch

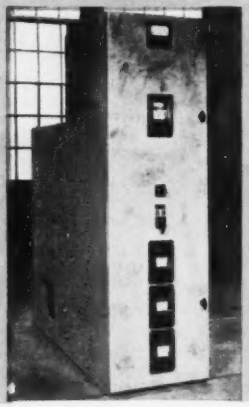
ELECTRIC ROASTER RANGE

YOU CAN BE SURE.. IF IT'S Westinghouse

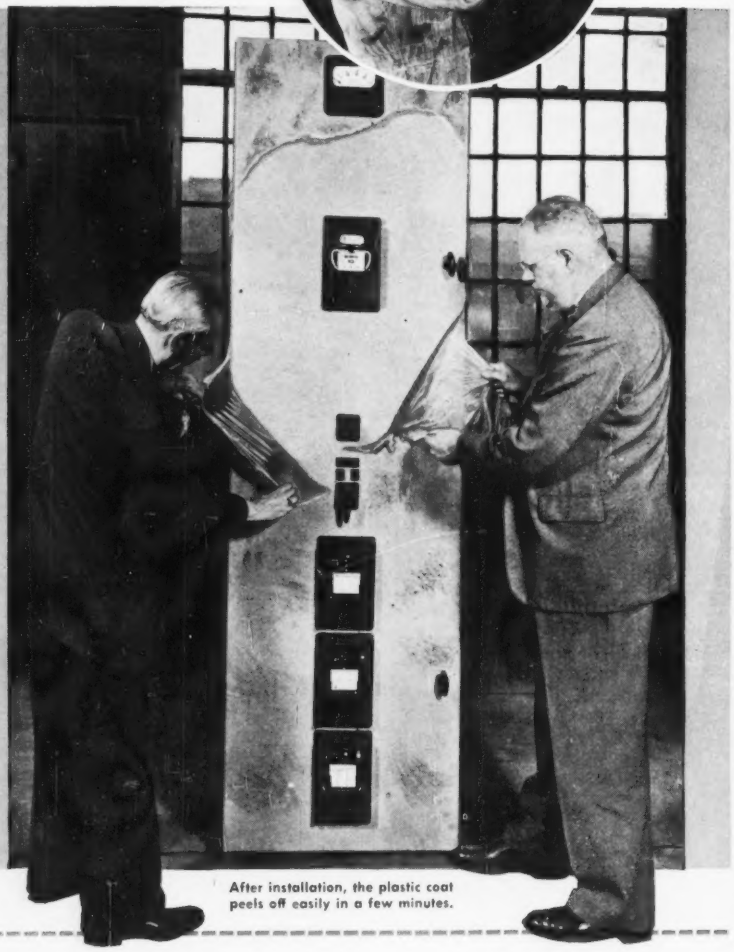
IN 1947

Westinghouse provided All-Weather Undercoating... Lifetime protection for undersurfaces of *outdoor* switchgear

Plastic coating is sprayed on the switchgear panel before assembly, just after final painting.

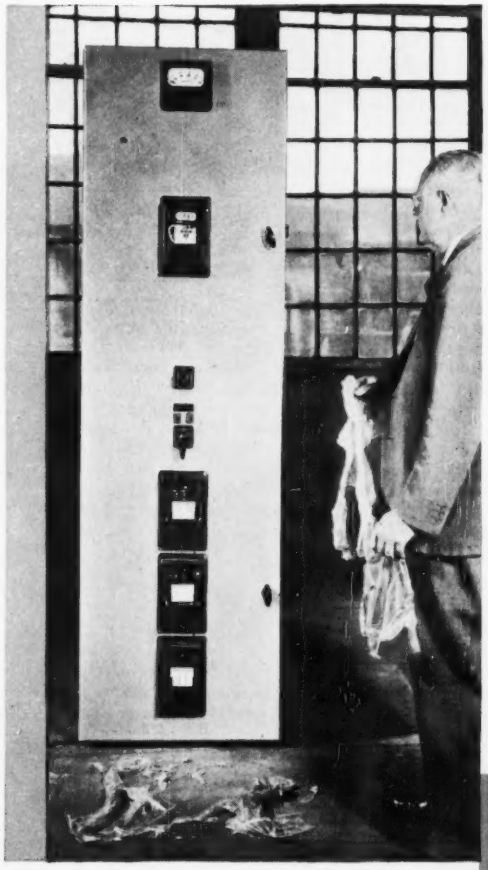


Unavoidable smudges and grease on this switchgear unit affect only the protective plastic coating.



After installation, the plastic coat peels off easily in a few minutes.

NOW... PLASTIC PROTECTION for Indoor Switchgear



Removal of the plastic coat reveals the original smart appearance of the switchgear unit.

Another Westinghouse Switchgear Feature AT NO ADDED COST!

Dust, dirt and greasy fingerprints "peel off" switchgear units in a few minutes. The new plastic coating protects the smart appearance of metal-clad switchgear during shipping and installation. No longer is touch-up and repainting necessary to give your installation that "fresh-from-the-factory" appearance.

To give you this added benefit, Westinghouse employs a transparent plastic material. Sprayed on indoor metal-clad switchgear panels after final painting, it forms a tough protective coating that protects the finish through final assembly and wiring—and during shipment and installation. When the switchgear is ready for operation, simply "peel off" the plastic coat. Your installation then reveals the original factory finish. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-60689

Westinghouse

METAL-CLAD SWITCHGEAR

FOR ANY SYSTEM

THE MONTH IN BRIEF

DST Ends in California

Daylight saving time, having aided materially in reducing peak demand on California utility systems during the critical water period of 1948, officially ended at 2 a.m., Jan. 1, 1949. Fast time had reduced the December 1948 evening peak by 365,000 kw. or 7.7% on a total Southwest Power Pool demand of nearly 5,000,000 kw. New steam generation of 175,000 kw. during December 1948, with another 175,000 kw. due in January of this year, coupled with recent favorable water conditions, combined to cause Governor Warren to end daylight saving time two weeks earlier than it would otherwise have ended by legislative act. With the steam additions mentioned and large increments of steam and hydro under active construction, the California utilities now feel that, barring some emergency, the future power supply for the Pacific Southwest is assured.

Northwest Situation

Volumes of news coming out of the Northwest on the power shortage in that area all boil down to a few pertinent facts: (1) There is a peaking deficiency of approximately 150,000 kw. in the western part of the Northwest Power Pool. Reserves are 3,900,000 kw.; estimated winter peak is well over 4,000,000 kw. (2) Attempts so far to meet the situation have been on a voluntary basis with all agencies, private, municipal and public, cooperating. (3) No new industries using more than 500 kw. will be served, subject to review by the Northwest Utilities Conference Committee. (4) Large power users have been asked to shift hours of operation to reduce load at time of system peak; commercial customers have been asked to reduce window and display lighting; residential customers are asked to avoid as much usage as possible over the peak. (5) The Utilities Conference Committee has adopted a resolution discouraging additional electric house heating. Two PUDs have raised the last step in their residential rates to discourage space heating. (5) So far, voluntary curtailment has been only moderately successful. (6) Mandatory curtailment orders may soon be issued by state regulatory bodies to private utilities with public agencies expected to go along on the same basis. (7) Peaking deficiency may worsen and there may develop an energy shortage as well. (8) The situation will get progressively worse until McNary power is available in 1952 or '53. (9) Saving grace in the Northwest situation is a splendid spirit of cooperation among all power agencies of the area.

Television Link Seen

Tests are now being conducted by the Pacific Telephone & Telegraph Co. to determine repeater station locations for a television radio link between Los Angeles and San Francisco. Bell expects to have the micro-wave link in service by the end of 1949. The link will also furnish additional message telephone and telegraph circuits between the two cities. Television broadcasters have displayed interest in the new link, but so far none have announced definite plans for chain broadcasting of television programs. With the coaxial cable from the East to Los Angeles already in service and with the installation of a coaxial cable from Sacramento to Portland having been completed during the past fall, the Bell system of the West is rapidly providing facilities for relaying the ultra-high frequencies used for television.

Shasta Power Contract

Shasta Dam power will continue to flow into the Pacific Gas and Electric system on a day-to-day basis under an agreement entered into Dec. 29, 1948 by the U. S. Bureau of Reclamation and the utility. Under the new contract, PG and E will pay about 5 mills per kwh. instead of 4 mills as under the old contract. This will add some $1,700,000 to the cost of Shasta power to PG and E for 1949, bringing it to an estimated total of $8,100,000 for the year. By virtue of the new agreement, PG and E will no longer have to pay rental on the government-owned Shasta-Oroville 230-kv. transmission line which serves as one of two delivery points to PG and E for Shasta power.

The day-to-day basis resulted from inability of PG and E and the bureau to reach agreement on the question of "wheeling" power to federal agencies. PG and E has steadfastly refused to "wheel." A government suit to force PG and E to transport Shasta power through its system to federal agencies using a minimum of 500 kw. is pending before the California Utilities Commission with final briefs to be filed in February.

Four 75,000-kw. generators are now in operation at Shasta power house, the fifth and last similar unit to be in operation by March 1, 1949. Machines are being operated at 85,000 kw., giving Shasta a present rating of 340,000 kw.

Low-Tension Bus and Breakers Out

Pacific Gas and Electric's new Antioch steam plant will have its three 129,000-kva. generators connected direct to 220-kv. transformers without low-tension breakers or bus. Lack of commercially available breakers with enough capacity (6,000 amp.) was an important factor in the decision. Economy and simplicity of design were also strongly in favor of the scheme, which requires individual transformers for each generator. Alternate design for units of this size, using two 4,000-amp. breakers in parallel, is incorporated in PG and E's Moss Landing plant. In this case units supply both 110- and 220-kv. through autotransformers.

Kings River Development

An FPC examiner has recommended that the Bureau of Reclamation develop California's Kings River in the face of applications by Pacific Gas and Electric Co. and the Fresno Irrigation District for licenses. The irrigation district has asked for a 60-day extension of the Feb. 20 deadline set for filing protests.

Another KEARNEY *Triumph*

A New Low-Cost Secondary Fuse Cutout

- **Isolate service entrance faults**
- **Protect transformers from secondary faults**
- **Make banking of secondaries possible**

The demand for this Secondary Fuse Cutout was brought about by the successful use of Kearney Secondary Fuse Links.

Sturdily made of weather-resisting, non-metallic material (except for fuse link and spring), this unit transfers current from the secondary to the tap directly through the link itself with no intermediate connection or transfers.

The simplicity of design, without nuts or bolts to tighten, makes it possible to refuse and install this cutout in less than twelve seconds.

Just 3 Easy Steps to Refuse

STEP ONE: Drop the fuse link in the top opening of the cutout. Then, compress the lower shell and insert the tap wire in the hole provided in the link.

STEP TWO: Compress top shell and twist to the right or left so that it stays in the open position.

STEP THREE: Hang the cutout on the secondary, release top shell by twisting to make the final pressure contact with the secondary.

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McGRAW-HILL PUBLICATIONS

THIS MONTH'S NEWS

Compact Divides Pecos Waters

A compact dividing waters of the Pecos River between New Mexico and Texas was signed Dec. 3 by members of the Pecos Compact Commission at Santa Fe, N. M.

The compact must now be approved by the legislature of the two states and by Congress. The compact ends a 24-year-long dispute between the two states over division of the waters.

Signing the compact were John Bliss, for New Mexico, state engineer and member of the commission, Charles H. Miller of Barstow, for Texas, and Berkley Johnson, of the U. S. Geological Survey, federal member.

The compact sets no percentage of water or acre-feet guarantee for either state. It provides that New Mexico will not do anything to deplete the amount of water reaching the New Mexico-Texas state line below the amount available under 1947 conditions. Assuming water supplies remain the same as the average for the past 20 years, engineers said this guarantees New Mexico will not "by man's activities," cause the flow to drop below 250,000 acre ft. at the state line. It does not hold New Mexico responsible for drops in flow caused by natural conditions.

Water salvaged in New Mexico by federal or joint New Mexico-Texas projects will be divided on the basis of 57% to New Mexico and 43% to Texas. Unappropriated flood waters will be divided equally between the two states. Water salvaged by Texas projects belongs to Texas.

Each state agrees to support conservation projects to eliminate waste of water. Both states pledge they will not oppose any project designed to salvage unappropriated flood waters, prevent flood damage or do away with waste.

Detroit Dam Bids Will Be Opened

Bids for the main structure of the Detroit Dam on the North Santiam River in western Oregon, will be opened Feb. 24 at Portland.

The contract, which will be in excess of $20,000,000, will not include the power house or the reregulating reservoir. Total cost of the dam, part of the Willianette Basin flood control project, is estimated at approximately $65,000,000. It is one of three dams on the project slated for construction during the next few years. Others are Lookout Point on the middle fork of the Williamette and Dorena on Row River.

The contractor will be required to complete work within 1,300 days after starting. Excavation of 400,000 cu. yd. of solid rock and 315,000 cu. yd. of earth will be required. Diversion of the river during the construction period also is included in the contract.

Utah Power & Light Plans Steam Plant

Utah Power and Light Co. will buy a 26-acre tract at Pueblo and North Temple streets in Salt Lake City as a site for an $11 million steam plant. The site adjourns the present UP&L Jordan plant.

Planned as a 63,000-kw. plant, it is to be the largest single generating unit in the company's system. According to President George M. Gadsby, its design will permit expansion to 200,000 kw. in the future. Preliminary construction is to begin in 1949, with power production scheduled in September 1951.

The plant will use pulverized coal fuel, and will have hydrogen-cooled generators and turbines. The unit's boilers will operate at 1,400 lb. of pressure and will be capable of an output of 620,000 lb. of steam per hour. The plant is designed to burn 740 tons of coal each 24 hours.

Installation of the plant is part of the company's $61 million five-year expansion program.

Appropriation Granted Seattle City Light

Seattle City Light's request for an $11,000,000 appropriation for additions to the city system has been approved by the Municipal Board of Public Works.

The appropriation includes $230,000 for a 230-kv. bus and Ross-Diablo line terminal at Diablo; $5,800,000 for a 230-kv. transmission line from Ross Dam to the Bothel switch station; $2,360,000 for additional capacity at Bothel substation; $210,000 for a 15-mile, 115-kv. transmission line for a 100,000-kva. receiving substation.

Some of the equipment has been ordered under previous appropriations but certain items will not be delivered until 1951 or 1952.

Light the path ahead

WITH SQUARE D's

NEW Low Voltage Control System

use this

Remote Control Relay System

instead of conventional switching

for greater

CONVENIENCE · SAFETY · COMFORT

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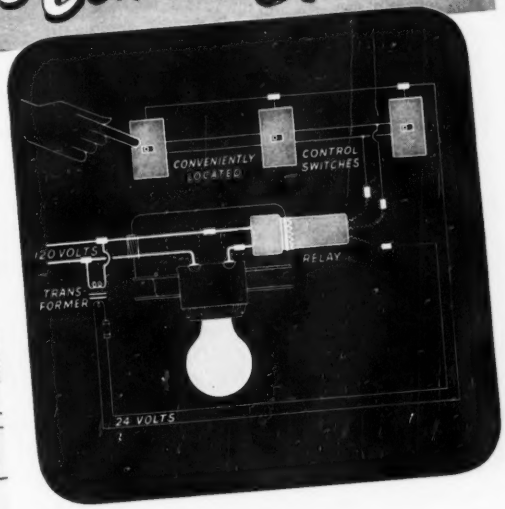

LIGHTS OFF IN GARAGE
AND ON IN KITCHEN

LIGHTS OFF BEHIND
AND ON AHEAD

LIGHTS ON FOR A LOOK
THEN OFF ALL OVER

● The above sketch shows how remote control relays are installed in knockouts of outlet boxes. The relays are controlled from any number of conveniently located switches operating on a 24 volt system. Only the load circuit wiring is at 120 volts.

One relay can be operated by several control switches, or several relays can be operated from one or more locations, using master switches.

Write **for Bulletin No. 1008, which gives details of this simple, low-cost way to adequate switching.**

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PG and E FILES FOR HYDRO PERMIT

Pacific Gas and Electric Co. has filed with FPC for a preliminary permit to develop hydroelectric power potential on the American River in northern California, where construction has been started by the Corps of Engineers on the $50,000,000 Folsom Dam.

The proposed development would include construction of three new power houses and reconstruction of the company's Folsom power house for a total installed capacity of about 134,000 kw.

The development is so planned that it will not interfere with the primary purposes of the dam, flood control, irrigation and fish conservation, the company said. PG and E asked for a 24-month permit while data necessary for filing a normal application are obtained.

Largest of the four plants, the 95,000-kw. Folsom Dam power house, would be built at the downstream base of the new dam. The maximum static head for this plant would be 258 ft.

Lower American River power house No. 1, two miles below the new dam, would be an enlargement of the 53-year-old, 3,800-kw. Folsom plant, oldest of the company's hydro plants. With an installed capacity of about 12,000 kw., this plant would have a static head of 75 ft. The existing forebay and 8,800 ft. of canal would be retained.

A 7,000-ft. tunnel would be built to bring water from the existing diversion dam to power house No. 2, just below the Folsom highway bridge, with an 88-ft. static head and 22,000 kw. capacity.

Power house No. 3, 5,000 kw., 35-ft. static head, would be located below the projected Folsom-Ripon diversion dam, to be built for irrigation purposes.

Pacific Schedules Portland Additions

Pacific Power & Light Co. will construct a $1,000,000 main power substation to serve as center of transmission and distribution for the Portland area, it was announced recently.

Two 50,000-kva. transformers will be installed at the new substation. Lines terminating there will include those running from the company's Merwin, Condit and Lincoln generating plants, high-tension circuits interconnecting with the Bonneville system, and with the Portland General Electric Co. system.

The new unit will be linked closely with the company's $3,500,000 Merwin hydroelectric project on Lewis River in southwestern Washington, where a second generator is to be installed.

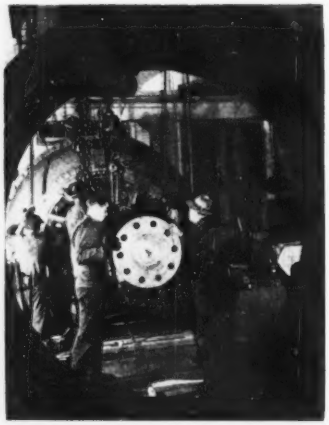
Orders for the transformers were placed in December 1947, with delivery scheduled for December 1949. Special cooling equipment will make it possible to carry two-thirds more than rated load, giving the transformer bank a total capacity of 166,666 kva.

New Mexico Company Completing Addition

Installation of a 11,500-kw. turbine and generator at the Albuquerque power plant of the Public Service Co. of New Mexico is nearing completion, as one of the last phases of a $3,500,000 construction program the company has had underway for 18 months. The new turbine-generator, costing $1,200,000, is being installed under the supervision of H. E. Johns, G-E engineer at Denver. Installation is expected to be complete Dec. 18.

President Arthur Prager has announced plans for an additional $6,000,000 expansion program for the utility systems in Albuquerque, Santa Fe, Deming and Las Vegas. This program is expected to take 18 months to complete. Principal work done will be in expanding electric and gas distribution systems.

After 35 years' service, an old electric motor (foreground) was called to a new job by Washington Water Power Co. in the Monroe St. Bridge station in downtown Spokane. Use of the motor will mean an additional 650 hp. for the Northwest Power Pool and is one of the measures being taken to forestall a winter power shortage. The motor was used previously to drive a d-c generator at the Post St. substation of Washington Water Power Co.



TACOMA DEVELOPMENTS STUDIED BY ENGINEERS

Tacoma's plan to build two power dams on the Cowlitz River has been taken under advisement by the Washington State Department of Conservation and Development, following two days of public hearings. Director Frank A. Stewart said that he and his engineers would "study the record carefully and then reach a conclusion."

Tacoma holds a permit, which it purchased sometime ago, for a dam at Mayfield, and seeks one from the department for a second dam at Mossyrock 12 miles upstream. Opponents of the project, spearheaded by the state department of fish and game, want the application denied and the whole matter submitted to the legislature. They want that body to pass on the question of establishing a fish sanctuary on the lower Columbia River and tributaries below the McNary Dam. That barrier, they say, will end the spawning of migratory fish in the upper Columbia.

Counsel for the city of Tacoma declare that the city had complied with state laws in connection with the dams, and that engineers had to consider the maximum use of the river.

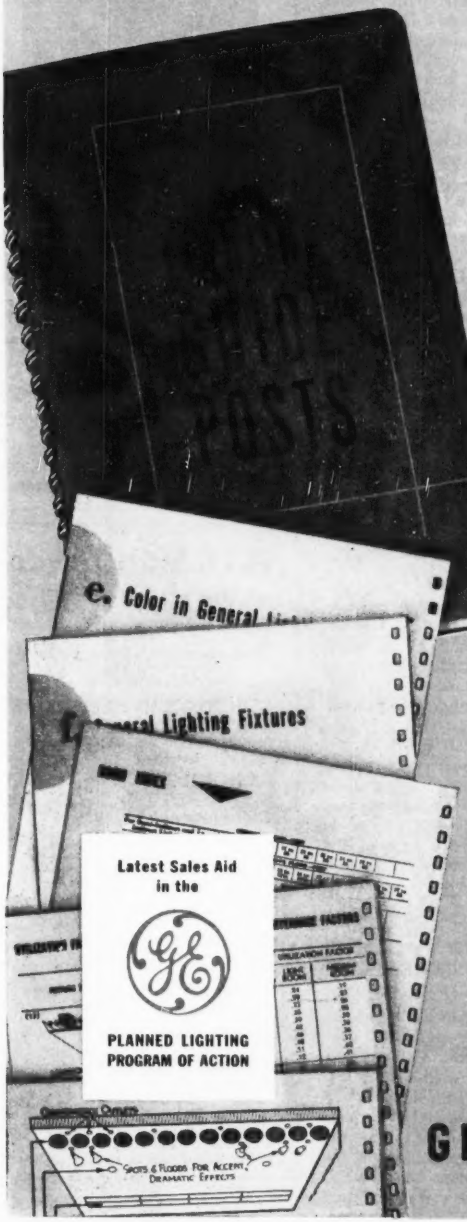
PUD Sells Bond Issue For Expansion

Benton County PUD has sold a $325,000 revenue bond issue to Ballard & Hassett of Des Moines, Iowa, to help finance a $450,000 expansion program for 1949, according to Willard A. Campbell, president of the PUD's board of commissioners. The 30-year issue bears an interest rate of 3¾%.

The program includes $225,000 for lines and facilities to serve new customers, $40,000 for a new Kennewick substation, $50,000 for new street lighting, $60,000 for transformers, $20,000 for meters and equipment, $5,000 for installing a Bonneville Power Administration 3,750-kva transformer at the Prosser substation, $7,000 for transportation equipment and $30,000 for new buildings.

● UNDER full development, the Fraser Valley watershed, covering approximately one-quarter of the B. C. area, is capable of producing 6,000,000 hp. of electrical energy, according to a statement made following a meeting of the Dominion-Provincial Fraser River Basin Board, a body set up to advise the two governments on development and control of the river. The board's study involves engineering studies of flood control and power development and effect on fishing, wild life and forests.

Sell Planned Lighting easier, faster with this new book!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The typical pages shown here give you an idea of the kind of information contained in "Planned Lighting Guide Posts". It is a complete sales tool for both new and experienced lighting salesmen.

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The "Planned Lighting Guide Posts" is available through your G-E Lamp District Office at cost—$1.10 a copy. It's another part of G-E's extensive lighting program of action to help you sell more Planned Lighting in your area. Call your nearest G-E lamp supplier today!

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EARTH ANCHORS

*REA APPROVED

P-L ALL STEEL, EXPANDING TYPE EARTH ANCHORS

Here is the first really efficient, two-piece earth anchor that is of simple, fool-proof, all-steel, heavy-duty construction. P-L Earth Anchors are exceptionally rugged and possess tremendous holding power. P-L Anchors can do a better job and can be installed quicker in all types of soil. Everyone from the engineer to the lineman can appreciate the ease of handling and installation.

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FOR LITERATURE WRITE

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TIE PLANNED BETWEEN B. C. SYSTEMS

A substation and transmission line will be built to tie in the system of B. C. Electric in the southern section of Vancouver Island with the Campbell River power development of the B. C. Power Commission in the northern and central sections of the Island, it has been announced. The project will involve construction of a 66-mile transmission line on steel towers from Victoria to Nanaimo and will call for an expenditure of approximately $3,000,000.

The line is expected to be completed by October 1950. The B. C. Power Commission recently erected its own high-tension line from Campbell River to Nanaimo, B. C.

When it is completed the company will have an extra 18,000 hp. of electrical energy available by purchase from the commission to supply the lower Vancouver Island area. This will step up the power supply of the area by one-third.

Campbell River Project Will Double Output

The John Hart hydro project at Campbell River on Vancouver Island, B. C., is scheduled to double its output to 100,000 hp. by next May.

S. R. Weston, chairman of the B. C. Power Commission, reports work on the project is proceeding satisfactorily, and that May has been set as the target date for bringing into operation the third and fourth 25,000-hp. units now under development.

First 25,000-hp. unit went into operation at the first of last year, with the second being added last spring.

To increase the capacity of the project, a new storage dam is being built at Ladore Falls to back up water in Campbell Lake, and is expected to be completed during the winter. The power house will be extended to take in the additional two units.

Arizona Edison Adds New Properties

Continuing its expansion program, Arizona Edison has purchased the Bisbee-Warren bus lines and the electric, domestic water and sewer systems serving Warren in Cochise County in southern Arizona. Reid Gardner, Arizona Edison president, said the company also is negotiating for the purchase of the Southern Utilities and Supply Co. and Gibson Water Co. at Ajo in Pima County.

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Jeffries Transformers

Reasonable in Price
Reliable in Performance

Jeffries large transformers are priced reasonably—and you can save their first cost in a short time by minimizing current losses. When you use a Jeffries transformer, you can provide voltage change at the point desired, without prohibitive expense.

We supply all types and sizes. If not in stock, we build to order in a hurry—a week to 10 days.

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What Are *YOUR* Chances If There Are No Profits?

Since the November 2 election there has been a dazzling variety of plans to have the government do more and more things and spend more and more money. But there is almost no variety in the plans which are suggested to raise the money.

"Pay for it by taxing profits," is the standard refrain. Slap on an "excess" profits tax. Boost the corporations' income tax rate.

Well – why not? Haven't the corporations been making so much money that a big chunk of it can be turned over to the government spenders without hurting anybody?

The answer is no!

How high profits should be can be debated endlessly. Some people claim that 1948 corporation profits, which will amount to about $20 billion, are too high. They emphasize the fact that profits are larger in relation to investment than they were a few years ago. Other people think profits are low. They stress the fact that profits are not much larger in relation to sales than they have been historically. Both sides agree that in some individual cases profits have been too high, as in others they have been too low or non-existent.

But if we cut the total volume of profits drastically, we shall do so at our national peril.

There is no room for debate about that. For we shall choke off the crucially important job of building new plants and equipment for our industries. Squeeze hard enough, and America will go the way of Britain – down the long and painful skids of industrial decline. Widespread unemployment, especially among our industrial workers who produce new plants and equipment, will mark the dreary way. Here is a fact which the President, the Congress, the C.I.O., and all of us have a real reason to remember:

Almost two-thirds of all profits today are going to rebuild and improve plants and equipment.

More than $13 billion of this year's profits are being plowed back. They are going – as a large proportion of profits have always gone – to buy for workers better tools to work with, better surroundings in which to work. They are making possible better products, and more of them, for all of us.

The figures below show how companies have put more and more profit-dollars and a larger share of their profits to work in the business:

YEAR	PROFITS REINVESTED	% OF TOTAL PROFITS
1929	$2.6 billion	31%
1939	1.2 "	24%
1943	5.9 "	57%
1944	5.2 "	53%
1945	4.2 "	47%
1946	6.9 "	55%
1947	11.2 "	62%
1948 est.	13.0 "	65%

continued on next page

The record shows that each of us is the real beneficiary of this plowing back of profits.

Every American has benefited from these profits. Each dollar that business has put into its plants and equipment in the last thirty years has increased our yearly production by 35 cents.

This re-investment of profits has helped make possible a 75% increase in living standards since 1919.

It has helped increase wages from an average 48 cents an hour in 1919 to $1.36 today. Allowing for higher prices, that increase means that an hour's work today will buy twice as much as it did thirty years ago.

Why must business retain these billions of profits to improve its plants and equipment? Why must it plow back more and more? *The reason is that business already is caught in a tax squeeze.*

Federal taxes alone take at least thirty-eight of each one hundred dollars a company earns. Then, if the company pays out to its stockholders any part of what is left as dividends, the federal personal income taxes of the stockholders may take up to 77% of those dividends. Under these conditions, so few people are willing to invest in industry that the stock market is stagnant. Companies can not raise in that market the money they need for improvements.

The result: business must rely more and more on plowed-back profits to pay for new plants and equipment.

We know that everywhere in industry new and better ways of producing goods are standing ready for use. The previous editorial in this series mentioned some of them. We know, too, that depression and war put our industries far behind schedule – as much as $100 billion behind – in getting the new tools they should have had to keep themselves in first-class shape. McGraw-Hill is now completing a survey of industry that will measure these needs. The results will be published in this editorial series. We know already that in 1949 alone industry will need $18 billion or more for this purpose.

And all but a small fraction of that sum must come from profits.

Our prosperity, our strength as a nation, our hopes for better living depend on our continuing to generate and to plow back a large volume of profits.

For that reason we should not thoughtlessly follow these people who propose to pay for any and all new government activities by saying simply, "Soak the corporations." There is no need to follow them. There are other ways of obtaining necessary funds.

First and foremost should be economy within the government itself. If its citizens must pay still higher taxes, then surely government should exercise rigid self-restraint, cutting out all but the most essential activities and expenses.

After economy should come consideration of a broader federal tax base.

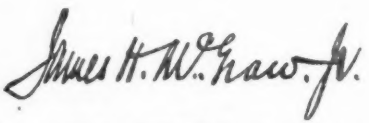
If these and other methods of raising money are inadequate and if taxes must take a bigger bite from business profits, two facts are clear. We should not adopt an "excess" profits tax with all of its complications and all of its corrupting effect on business. A moderate increase in the regular income tax on corporations is much less dangerous. *But even such an increase, if necessary, should be accompanied by special allowances for expansion and depreciation that will encourage companies to continue spending their earnings for new plant and equipment.* We all have a stake in that.

At this critical juncture in our history profits have a new and vastly more important role than they have ever had. In unprecedented degree they are the drive behind our present prosperity and the key to a better, stronger future.

Give profits the axe and the blow does not stop there.

It cuts into the employment, the prosperity and the strength of our nation.

Everyone of us has a stake in how the President and Congress handle taxes on profits – and now is the time to remind them of that stake.



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FOURTH UNIT IN AT LOS ANGELES PLANT

Unit No. 4, went into service at the Department of Water & Power Harbor Steam plant in Los Angeles last month.

The 75,000-kw. unit is the third steam generator to go into service at the Harbor plant. Unit No. 1 was placed on the line in June 1943 and Unit No. 2 in 1947. Units 3 and 5, each of 100,000-hp. capacity, are under construction and will be completed early in 1949.

The new turbine generator was manufactured by Westinghouse Electric Corp. Electricity is generated at 13,200 volts and stepped up to 132,000 volts. Energy source of the unit is its $904,980 boiler purchased from the Riley Stoker Co. Twelve burners, utilizing either oil or gas, can produce 650,000 lb. of steam an hour at a pressure of 950 lb. a square inch at a temperature of 900°. The burners will use 416,000 barrels of oil a month, a daily equivalent of 37 railroad tank cars.

Sea water is brought into the plant's condensers from one of the harbor channels through two concrete pipes 1,000 ft. long and 8 ft. in diameter. The pipes have a capacity of 600 second ft., or 646,000 gal, a day. Following condensation, twin sets of waterpipes serve the entire plant.

When completed, all five of the generators will require 275,000 gal. of sea water each minute, or 1½ billion gal. an hour—more water than is now used by the city of Los Angeles for all purposes.

Representing an outlay of $42,000,000, the plant is one of the largest modern steam generating plants in the nation.

Installation of the new unit was under the direction of Samuel B. Morris, general manager and chief engineer; Charles P. Garman, chief electrical engineer, and Grant E. Benkesser, head of the design and construction division.

Power Dispatchers Hold Meeting in Northwest

Necessity for every member system of the Northwest Power Pool to hold tight as long as it is electrically possible in case of a major pool disturbance, was emphasized by Prof. E. C. Starr, Oregon State College, and engineering consultant of the Bonneville Power Administration, in a discussion of system stability before the American Power Dispatchers Assn. at Chehalis, Wash., recently. Professor Starr explained that, under some conditions, any one unit of the pool might remain more stable internally during a disturbance involving a drastic drop in frequency if it were to cut free and operate independently during the emergency, but pool members are committed to an arrangement of over-all mutual assistance, which contemplates not only the transfer of kilowatt-hours over extended periods of time, but also the momentary exchange of large blocks of kilowatts and reactive kva. No system can tell when it may be the chief recipient of such stand-by benefits, and in all fairness must contribute to the over-all mutual assistance program to the limit of its generator and tie-line capacities. The point was raised following Professor Starr's exposition of the three kinds of system stability, static or steady state, dynamic and transient.

The American Dispatcher's Assn. is an organization of load dispatchers organized in 1946, functioning as a self-improvement group. The infant organization now boasts 274 members representing 37 power systems in 18 states, Hawaii and British Columbia. Lloyd Benson of Seattle City Light is president and C. N. Alldredge, BPA, secretary-treasurer. All members of the Northwest Power Pool, public and private, are represented in the membership. Local chapters are formed so that regional meetings can be held.

● FPC has set actual legitimate original cost of ten FPC-licensed hydroelectric developments of Utah Power & Light Co. at $8,584,050.16 as of Dec. 31, 1936. Items totaling $920,933.72 were eliminated. Since $605,488.80 has been adjusted on company books on previous commission order, only $315,444.92 still remains for adjustment.

● FPC has set $14,176,096.33 as original cost of two of the three dams comprising Pacific Gas and Electric Co.'s Pit River hydro development. In its order, the commission disallowed as part of the cost of the two units items totaling $680,887.22.

● WASHINGTON POWER CO. has purchased the electrical distribution system at Potlatch, Idaho, from Potlatch Forests Inc. and will rebuild facilities. The power company had wholesaled power to the town since 1931.

This new hot-line truck put into service recently by Puget Sound Power & Light Co., is operated independently of line trucks and routed to company divisions as required. A crew of five is supplemented by local help if necessary.

Panel truck was purchased from war surplus and completely rebuilt in company shops to specifications of L. G. Hayden, supervisor of the hot-line crew, pictured. Safety line tools permit work on 55,000- to 110,000-volt lines hot

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McLAUGHLIN CALLS FOR IMMEDIATE PURCHASE

Immediate purchase by Seattle of Puget Sound Power & Light Co.'s facilities in the area—"not next year, not in 1952, but right now" was urged by Frank McLaughlin, Puget Power president, in a recent speech at Seattle.

"The public interest requires" the purchase "at a fair price," he said. The city council's 1943 action in serving notice that the company's franchise would not be renewed upon its expiration in 1952 was a death sentence to the private company, McLaughlin declared. "With money tight and risk capital scarce today, it is unreasonable to think that investors will put millions of dollars into a situation where there is no assurance of getting their money back," he said.

Referring to the Pacific Northwest "kilowatt crisis," McLaughlin called upon the federal government to proceed as rapidly as possible with the construction of such water storage projects above Grand Coulee Dam as will firm up the additional capacity to be installed there in the next few years. The 1,000,000 kw. of additional capacity scheduled to be installed at Grand Coulee between now and 1952 for the most part represents peaking capacity only, he pointed out, and any substantial amount of increased firm power cannot be obtained at Coulee until additional upstream dams are built.

The federal government has gone so far in the matter of power development in the Pacific Northwest, which it has tied in with irrigation, flood control and other purposes, with amounts of money involved for future development running into billions of dollars, that problems of great magnitude would be encountered if the various states affected were to assume the obligations of the federal government in the matter of assuring the region an adequate power supply, McLaughlin said.

McLaughlin called for the creation of a framework of federal government policy, procedure and administration, with a maximum of home rule, which would seek to assure the Pacific Northwest an adequate power supply.

"There must be prepared at the earliest possible moment a long-range regional program which all interested parties will agree to and which will provide for the most economic development of the region's water resources," he said. "Some changes will be required in procedures and methods as to legislation, administration and financing in order to put power development on a firm schedule. Some machinery must be established whereby the people of the region have a definite say so in the preparation and carrying out of such a program."

● PROPOSED tieup between the Columbia River power system and the northern California system, through Mount Shasta facilities, is feasible and practical from an engineering standpoint, Dr. Paul J. Raver, Bonneville administrator, told the Bonneville advisory council, meeting at Longview, Wash. The tieup would come through a 230-kv. transmission line. No decision has been reached on the proposal, Dr. Raver said.

● THE NEW MEXICO Public Service Commission has granted the El Paso Electric Co. authority to grant its customary December rate cut to its customers in the Mesilla Valley area of New Mexico. The company for several years has given its customers a "Christmas gift" in the form of lower rates for December.

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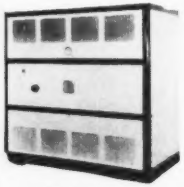

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CONDEMNATION DISMISSAL MOTION IS OVERRULED

Motion by Puget Sound Power & Light Co. to dismiss a condemnation action brought against its properties in Snohomish County, Wash., by the Snohomish County PUD has been overruled by District Judge Lloyd L. Black in federal court at Seattle.

The company contended a state law required PUDs to file condemnation actions in state courts but Judge Black pointed out that the language of the state act granting PUDs the right to eminent domain in the same manner as incorporated cities and towns does not mention such a provision. Further, he said, an initative enacted into law by ballot in 1930 mentioned that the PUDs could sue in my court of competent jurisdiction. The courts should be slow to deny access to the federal courts unless statutes state clearly that such access is to be denied. Judge Black said.

In a hearing on the public use and necessity of the litigation, Patrick Johnson, Puget Power vice-president, testified a condemnation action brought by the Snohomish PUD against the company in 1943 had cost the company $312,000, and predicted the new case would cost about the same. A jury in the earlier case placed value of the properties at $9,500,000 but the PUD commissioners rejected the award as too high.

Properties involved in the present suit are virtually the same except for the addition of two 55,000-volt transmission lines and several minor changes. The PUD hopes to get the properties for $8,000,000 while the company has been reported to be asking nearly $18,000,000.

Utility Asks District to Clarify Condemnation Suit

Request that Union County (Ore.) PUD make "more definite and certain" its complaint in condemnation proceedings involving California - Pacific Utilities Co. properties in LaGrande and vicinity has been filed by the company in U. S. District Court at Portland.

In its petition, California - Pacific asks that the PUD be required to state the price it offered for facilities and to reveal the full content of district resolutions directing condemnation proceedings. The district also is asked to state whether it intends to acquire all the company's facilities in Union County, including those used to provide gas to the city of LaGrande.

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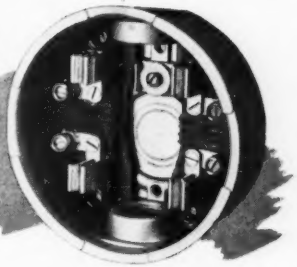

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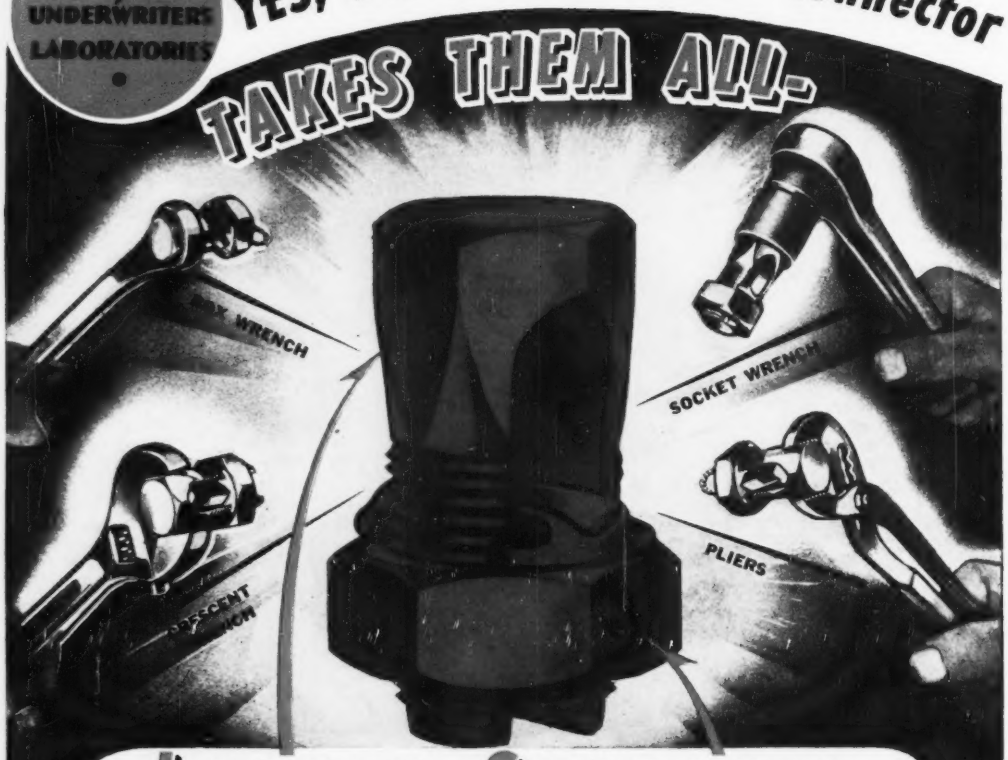

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SAN DIEGO MAY INCREASE TRANSMISSION TO MEXICO

San Diego Gas & Electric Co. has received FPC authorization to increase its transmission to Mexico from the previously authorized annual total of 22,200,000 kwh. to an amount not to exceed 45,000,000 kwh. per year.

Under the order, the company may transmit up to 40,000,000 kwh. yearly at a rate of 7,000 kw. over its 12-kv. line opposite Tia Juana. Previously the company was limited to 20,000,000 kwh. at a rate of 4,000 kw. on this system. It may also transmit to a point opposite Tecata, Mexico, either 2,500,000 kwh. a year at a rate of 500 kw. on a 2.3-kv. line, which previously was limited to 200,000 kwh. at an 80-kw. rate or 5,000,000 kwh. at a rate of 1,000 kw. over a 12-kv. line previously limited to 2,000,000 kwh. and a rate of 550 kw.

San Diego Gas & Electric sells electricity to M. P. Barbachaho and Cia. Electrica Fronteriza, S. A., a Mexican company, at two points on the international boundary near Tecata and Tia Juana.

Sierra Pacific Installing Water Heater Controls

Sierra Pacific Power Co., is installing company-operated controls on 1,600 of the 4,800 automatic water heaters on its system. The controls being installed at this time will all be in Reno and Sparks, Nev., and nearby areas, and the project is expected to be completed by Jan. 31.

Frank Tracy, Sierra Pacific president, announces that permission for the installation was granted by the Public Service Commission some time ago at which time a reduced power rate for water heaters became effective. The reduced rate was made possible by the system of company-operated controls, Tracy said.

The Sierra Pacific rate for water heaters is now 1½c for the first 300 and 1c thereafter. Rates for other domestic uses averages 2.68c throughout the system, but go as low as 2c.

● PACIFIC County PUD No. 2 of Raymond, Wash., has purchased Puget Sound Power & Light Co. lines serving the Lebam area in the eastern part of the county. Price of the lines, which the PUD has been using for several months, was $30,000.

● MONTANA Power Co. has been ordered by FPC to apply for license for its nine developments on the Missouri and Madison rivers. The opinion was based on the commission's contention that the developments occupy navigable waters. The dams affected are Morony, Ryan, Rainbow, Black Eagle, Holter, Hauser and Cayone Ferry developments on the Missouri River and Hebgen on the Madison. Application for a license for a second development on the Madison has been filed by the company.

Union Officers Expelled By CIO in Bay Area

Fifteen officers of four San Francisco Bay area locals of the CIO Utility Workers' Union were expelled for "dual union activity and other disloyal and traitorous acts."

They were tried in absentia at a hearing conducted in San Francisco by national CIO officials, following their suspension recently by the national CIO convention in Washington for dual unionism and Communist sympathies. (E WEST, November p. 106.)

The fifteen have organized a new local under a charter for the AFL International Brotherhood of Electrical Workers and claim the support of a majority of the some 2,500 employees of the Pacific Gas & Electric Co.

Petitions are before the National Labor Relations Board for an election to determine union preference either among the physical workers now affiliated with the CIO or the physical workers of the whole PG and E system. A NLRB hearing is expected to be set before the end of the year.

Earlier petitions by the AFL for an election covering both clerical and physical workers were withdrawn.

The four locals headed by the expelled officials were the San Francisco, Martinez, Redwood City and Santa Rosa groups. The seceding officials also claim followers in the other four CIO locals in the area. The IBEW now represents PG and E workers outside the Bay area.

● USBR has announced that Newport News Shipbuilding and Drydock Co.'s bid of $2,570,000 was low on the construction and installation of the final three 165,000-hp. turbines in the east power house at Grand Coulee Dam. First power production from the east side plant is scheduled for May 1, 1949.

● ORGANIZATION of the Rio Arriba Electric Cooperative Inc., to serve rural communities in northern Rio Arriba County, N. M., has been completed. Rodolfo P. Ortiz, merchant of Lumbertan, is president. The co-op has applied for a $450,000 loan from REA.

COMMISSION ABOLISHMENT ASKED BY PICKETT

Abolishment of the Public Service Commission of New Mexico, and transfer of its duties to the state's corporation commission, has been advocated by Ingram Pickett who takes office Jan. 1 as a member of the corporation commission. He said a bill to effect the change will be introduced into the state legislature on the first day of its session in January.

Pickett, Democratic candidate for corporation commissioner, campaigned on a platform which included a plank to abolish the public service commission, established by law only a few years ago. It has jurisdiction over electric, gas and water utilities and members are appointed by the governor.

The corporation commission was established by the state's constitution when it went into effect in 1912, and has jurisdiction over telephone, telegraph, railroads and other forms of transportation. Members are elected for six-year terms, one member coming up for re-election at each biennial election.

● A $7,302,674 CONTRACT for the first four generators for McNary Dam on the Columbia River in eastern Oregon has been awarded to General Electric Co. Unit price of the four 73,684-kva. a-c generators is listed at $1,800,000. The first generator is scheduled for installation by Nov. 1, 1953, and will be ready for commercial service by April 1, 1954. The second generator is scheduled for service at the same time, with the third to be ready by Sept. 15, 1954, and the fourth by Jan. 15, 1955. The Corps of Engineers is negotiating with General Electric for earlier delivery, installation and service dates, if possible.

● WASHINGTON Water Power Co. won a delay of several months in the execution of a condemnation action brought by the Chelan County PUD, when the state supreme court last month ordered the verdict of the county superior court brought up for a review en banc on May 2. The lower court ruled in favor of the PUD on Nov. 19. Properties concerned include a 48,000-kw. hydroelectric plant on the Chelan River, plus substations, transmission facilities and distribution lines.

● WASHOE, Ormsby and Storey counties in Nevada returned to standard time Dec. 1, leaving only five of the state's counties still on Daylight Savings Time. Nine counties had taken earlier action, starting in October.

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1 — 1500 H.P.
Bought and Sold New and Rebuilt
ELECTRIC EQUIPMENT CO.
ROCHESTER 1, N. Y.

NEWS ABOUT PEOPLE

● CHARLES P. JOHNSON, Western public relations manager for Westinghouse Electric Corp., was awarded the Westinghouse Order of Merit, highest award the company gives for distinguished service. Citation accompanying the award mentioned "his superior writing craftsmanship . . . self reliance in directing the company's public relations activities in a vast area far removed from headquarters; his faculty to form lasting friendships among staffs of newspapers and magazines throughout the West . . ." Johnson joined Westinghouse in 1939 at East Pittsburgh, later went to New York and to the Bloomfield lamp division; was transferred to San Francisco in September 1940.

● JOHN M. NELSON and IRA L. COTTOM have been appointed assistant superintendents by City Light of Seattle. Nelson has been with the department for 12 years, starting as an operator's helper and working up to senior electrical engineer. Cottom was in the abstract division of the city engineering department before joining City Light in 1943 as right-of-way and property agent.

● DON WILLIS, general sales manager of Central Arizona Light & Power Co., has appointed Bert Smith to the position of manager of sales promotion and advertising, and Al Tudor to director of publicity and advertising copy of the utility.

● DANIEL W. SEAGRAVE, superintendent of service and erection of Allis-Chalmers Seattle district office, has been appointed service manager of the firm's Pacific region. Headquarters will be maintained in San Francisco.

● ROY MCGANDY, manager of the Chehalis, Wash., office of Puget Sound Power & Light Co., has been transferred to Olympia as assistant to Manager Frank Walsh of the company's southern district.

● REAPPOINTMENT of William B. Himrod to the board of water and power commissioners of the Los Angeles Department of Water & Power has been confirmed by the city council.

● JACK BOSK has taken over duties as Western district manager for Schick electric shavers.

Dillin

● H. G. DILLIN, who has been associated with the San Diego Gas & Electric Co. in various capacities since 1924, has been appointed commercial manager of the company. He has been serving as rate engineer since 1932 and prior to that was employed in the record, appliance sales, and new service departments. Dillin succeeds ALFRED MAY, who recently retired after 37 years' service with the company.

● T. BROWN, Brown & Munton, West Vancouver, B. C., was elected president of the radio and appliance dealers division of the Retail Merchants' Assn. at Vancouver, B. C., recently. JOHN TAYLOR, B. C. Electric Railway Co., was elected vice-president.

● HENRY M. BRUNDAGE, former sales vice-president of Weber Showcase and Fixture Co., Los Angeles, has been named manager, automatic heating division of General Electric's air conditioning department with headquarters in Bloomfield, N. J.

● J. W. PENTRY, who left the Bonneville Power Administration three months ago to become auditor of the Clark County PUD, has resigned and returned to his former position.

● COMMISSIONER CLAUDE L. DRAPER of Wyoming has been elected vice-chairman of the Federal Power Commission to serve during 1949. Draper has been a member of the FPC continuously since 1930.

● FRANCIS BUSHELL has been named merchandise manager for the Butte, Mont., branch of Graybar Electric Co.

● H. B. WIFFEN has joined the staff of B. C. Electric Co. at Mission, B. C.

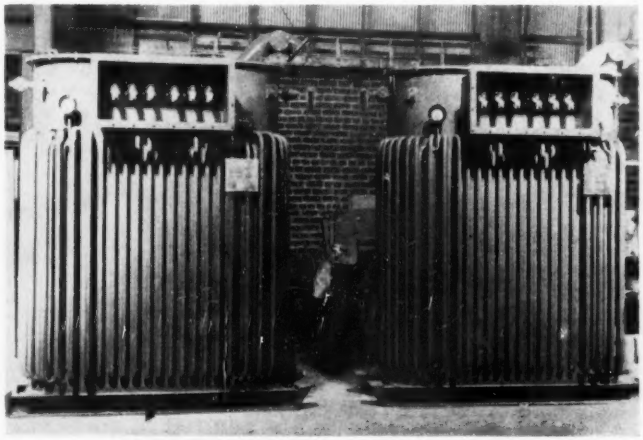
● E. S. HOLT, Oakland, has been appointed branch manager of the Emeryville plant of the manufacturing and repair division, Westinghouse Electric Corp.

● H. C. GERSTER, formerly Northwest district manager of General Electric Supply Corp., has taken over new duties as manager of the firm's California and Arizona district with headquarters in Los Angeles. He replaces F. C. Todt. S. S. Brundage, who has been with General Electric Supply Corp. in Portland for several years, has been appointed manager of GESCO in that city.

● JOHN R. FORD has been appointed manager of the newly opened Seattle office of the elevator division, Westinghouse Electric Corp., according to Robert W. Wagner, Pacific Coast district manager for the elevator division headquartered at San Francisco.

● WALTER FINK has been appointed sales promotion manager of Crescent Electric Supply Co., San Francisco.

● P. B. STROYAN, superintendent of Vancouver parks, is the new president of the British Columbia Association of Professional Engineers.



A pair of 750 KVA, 3-phase Gardner transformers, 2500 down to 500 volts, recently put into service in Southern California. Equipment includes magnetic oil level indicators, pressure relief diaphragms, and alarm type temperature indicators.

Custom-Built Transformers

Wherever space limitations, power supply, output requirements, operating conditions, or other factors present a problem—Gardner custom-built transformers furnish the answer. Today, by years of service in many states and in several foreign countries, Gardner special design transformers have achieved a unique record of efficient operation under the most varied and unfavorable conditions. Orders are accepted for capacities up to 1500 KVA.

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Los Angeles, MUtual 7245
Portland, ATwater 4173
Seattle, SEneca 2368

GARDNER TRANSFORMERS
GUARD PROFITS

General Electric Announces 2 ALL-NEW Time-Delay Fuses

THAT MAKE YOUR PROTECTION EXTRA SURE!

all-new

FERRULE FUSE

This easy-to-renew fuse has a combination of *protection* features and *convenience* features such as you've never had before. Thanks to a newly designed fuse link perfected by General Electric research, protection from harmful overloads is quick and sure—yet, limited transient overloads won't cause unnecessary "blows."

It's a timesaver, too. Only three parts enclose the link. Alignment takes care of itself when a new link is slipped in place. It can't be assembled with the link off-center or under strain. Caps come off and go on by hand. A new label makes identification easy.

You'll be buying these fuses in ratings from 3 to 60 amperes, for 250- or 600-volt requirements. Order a trial lot from your electrical supply house now, and watch them pay off as "headache preventers."

all-new

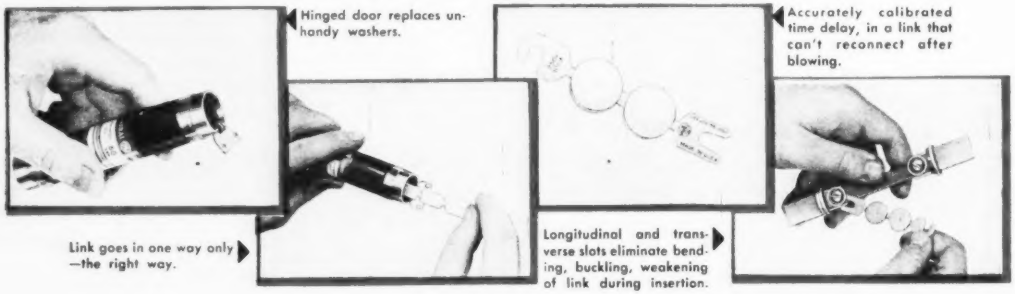
KNIFE-BLADE FUSE

You won't know which to rate "tops" in this design: the new time-delay link, or the sturdy assembly that makes such short work of renewal. Just remove one end-cap, and the fuse is disassembled. Screws can't fall out, and cup-shaped washers guide the link into place. The heavy-fiber bar-support is securely anchored to the blades. Alignment is bound to be right, even on large size fuses with more than one link.

Notice the disk design of the link sections. No chance here for "blown" link sections to overlap and re-establish contact.

This new fuse line includes ratings from 70 to 600 amperes, for 250- or 600-volt service. Try them once and you'll want them as your *first-choice* fuses.

For facts on new G-E fuses write to Section D13-125, Construction Materials Department, General Electric Company, Bridgeport 2, Connecticut.


Hinged door replaces unhandy washers.
Link goes in one way only—the right way.
Longitudinal and transverse slots eliminate bending, buckling, weakening of link during insertion.
Accurately calibrated time delay, in a link that can't reconnect after blowing.

GENERAL ELECTRIC

RESERVE SIGNAL UNIT SPONSORED IN WEST

First affiliated reserve signal unit to be formed in the 6th Army area comprising eight Western states, is that sponsored by the Central Pacific District of Graybar Electric Co., at San Francisco. It is known officially as the Headquarters and Headquarters Company, 321st Signal Base Depot.

According to J. P. Carson, Graybar district manager, the Army plans to create units of experienced personnel, veterans of World War II now in reserve, as part of the national defense program. For example, a signal unit will be trained to handle the procurement, storage and issue of Signal Corps equipment. In previous wars such training required many months.

Initial Graybar Electric Co. personnel of the unit are: Lt. Col. Burton R. Cole (commanding), San Francisco; Lt. Col. Arthur L. Nelson, Boise; Maj. Claude M. Perlewitz (executive officer), San Francisco; Maj. Elliot V. Anderson, San Francisco; Maj. Clyde A. Stevens, Boise; Maj. Allen W. Searle, Salt Lake City; Capt. Vernon S. Wilson, San Francisco; Capt. Ford S. Baron, San Francisco; Capt. James A. Twelves, Salt Lake City; Capt. Melvern P. Fenton, Sacramento; Lt. Stanley J. Russell, Fresno; Lt. Richard J. Steffens, Oakland; Lt. Harley T. Gaines, Salt Lake City; Lt. Kenneth N. Gardner, Salt Lake City.

Taken at the activation ceremony of the 321st HQ and HQ Co. Signal Base Depot at San Francisco, pictures show (top) J. P. Carson, Graybar district manager; Lt. Col. Burton Cole, commanding officer of the ORC unit; Col. Lloyd C. Parsons, signal officer, 6th Army; Brig. Gen. Frederick B. Butler, commanding general, Central Military District, 6th Army; (bottom) officers and civilian employees taking part in the San Francisco ceremony. (U. S. Army photographs)

● A. S. Moody, commercial vice-president of General Electric Co. in charge of the Pacific Northwest District at Portland, retired Nov. 20, following 42 years with the company. A graduate of University of California, he started his career in 1906 with the Stanley Co., then owned by G-E. When Stanley officers were consolidated with G-E in 1907, he continued with the company and in 1908 was transferred to Seattle. In 1910 he was made manager of the supply department in Portland and in 1923 went to Los Angeles as manager for G-E. He had been Northwest manager since 1924.

● E. E. Carleton, through competitive examination, has been promoted to senior standing in the Division of Industrial Safety for the State of California. Carleton was first connected with the Los Angeles Department of Water & Power, then the Division of Water Resources, and since 1946 with the Division of Industrial Safety. He has been active in the revision of the California Electrical Safety Orders. During the war he served as electrical and radar officer with the U. S. Navy. He has also been active in the International Assn. of Electrical Inspectors. As senior electrical engineer he succeeds George E. Kimball, recently retired. Carleton will headquarter in Los Angeles, however, whereas Kimball made the San Francisco office his headquarters.

● Herbert A. Bell, president of Packard-Bell, Los Angeles, has taken on additional duties as general manager, to fill the vacancy caused by the resignation of Howard D. Thomas Jr., executive vice-president and general manager of the firm. William H. Cies, sales manager, has taken over the job of director of sales for Packard-Bell, filling the vacancy due to the resignation of W. Lowell Wood. Joe M. Spain, who has been with the company for 12 years, will continue as vice-president and will assume additional executive duties.

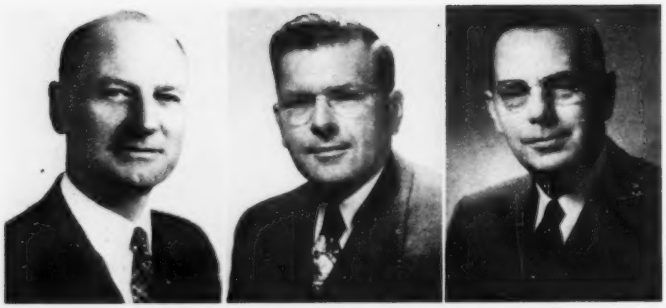
● Appointment of William G. Davis Jr., as superintendent of production planning, and Gordon White as assistant superintendent of production planning for the Pittsburg, Calif., plant of Columbia Steel Co., was announced recently.

● Thomas N. Hunt has been appointed as industrial engineer for Brown-Johnston Electric Co., Spokane. He was formerly with the Washington Water Power Co.

● Appointment of William W. Bracken as field supervisor of the floodlite division of S & M Lamp Co., Los Angeles, has been announced.

● Frank Richardson has joined the staff of Canadian General Electric Co., Vancouver, B. C., and will be in charge of traffic appliance sales.

● R. W. Beard has returned after six years in the East to take over duties as general manager of the Scott-Buttner Electric Co. Inc., Oakland.



Rhine Steindorff Gearhart

● MORRIS RHINE has assumed duties as assistant to the Pacific district manager of General Electric's apparatus department. In his new position Rhine will be special consultant for the company's major sales negotiations in California, Arizona and western Nevada.

● KURT STEINDORFF has been appointed to the newly created position of manager of the San Francisco office of General Electric apparatus department. His duties will cover the commercial, engineering and service sections for the company in northern California, western Nevada and the Hawaiian Islands.

● HERBERT C. BOSCH has assumed duties as manager of the Oakland sales office of General Electric Co. He succeeds SAMUEL G. GEARHART, who has been made manager of the industrial division's San Francisco office of General Electric.

● E. S. BJONERUD of General Electric Co. has been named manager of the resale section of the industrial division, San Francisco.

Deaths

Elwood Bachman, 57, electrical consultant and specialist for the General Electric Co. in the Salt Lake City area, died Dec. 14. Bachman was well-known in the construction, mining and electrical industry for his part in the electrification of Kennecott Copper operations at Bingham, Utah. Recently he was connected with the design and installation of the Utah Copper power plant. He was engineer in charge of all G-E installations during the construction of Hoover Dam, and for the Geneva Steel Plant at Provo, Utah.

● W. B. HEAPS, who for the past 12 years has represented Electrical West in the Chicago - St. Louis area, died suddenly of a heart attack on Dec. 25.

● JAMES E. CRILLY, 72, executive representative with General Cable Corp., San Francisco, died recently. Before joining General Cable Corp. in 1929, he was associated with Graybar Electric Co., San Francisco, as manager of the line material department.

● DONALD C. VAN HORNE, 48, died at Harrison Hot Springs, B. C., recently. Mr. Van Horne was president of Van Horne Electric Supply Co., and also head of Electrical Industries Ltd., manufacturers of electrical equipment. He had previously been sales manager for Canadian General Electric.

● WILLIAM C. STERNE, 78, died recently of a heart ailment at his home in Denver. He was president of Arvada Electric Co., vice-president of Littleton Lumber Co., and a director of the Public Service Co. of Colorado. He had served for many years as treasurer of the Rocky Mountain Electrical League.

● LEE F. ADAMS, who for several years attended Northwestern and Southwestern Section, International Association of Electrical Inspectors meetings in the West representing General Electric Co., for which he was standards consultant, executive department, died Oct. 14 at his home, Scotia, N. Y. He represented NEMA as chairman of its codes and standards committee. In 1930 he received the James H. McGraw Award for his standards work for NEMA.

● CLARE W. COLVIN, 62, member of the engineering staff of the B. C. Electric Railway Co. for the past quarter of a century, died recently while driving his car in Vancouver, B. C. Mr. Colvin joined the B. C. Electric in November 1919, as electrical design engineer and in succeeding years had been engaged in any significant engineering developments including power house design, Bridge River studies and electrical construction projects.

NOTES ON THE TRADE

● Rome Cable Corp. has taken over most of the personnel of Pacific Electro Sales Inc., its agents in San Francisco, Los Angeles, Portland, Seattle and Salt Lake City, and will handle all sales of its products and of the Andersen-Carlson Mfg. Co., as a direct factory agency under the direction of O. I. Lewis as Pacific Coast manager. C. H. "Ponzi" Kaufman and H. S. "Skip" Warren will be San Francisco and Los Angeles managers. The other lines carried by Pacific Electro Sales Inc. will be continued under that same company, which will be assumed by Harry Carroll who decided to stay with the agency business. These lines include Kindorf Devices, Touch-Plate, American Transformer Co., Southern States Equipment Corp. Carroll's temporary headquarters will continue at 1045 Bryant St., San Francisco.

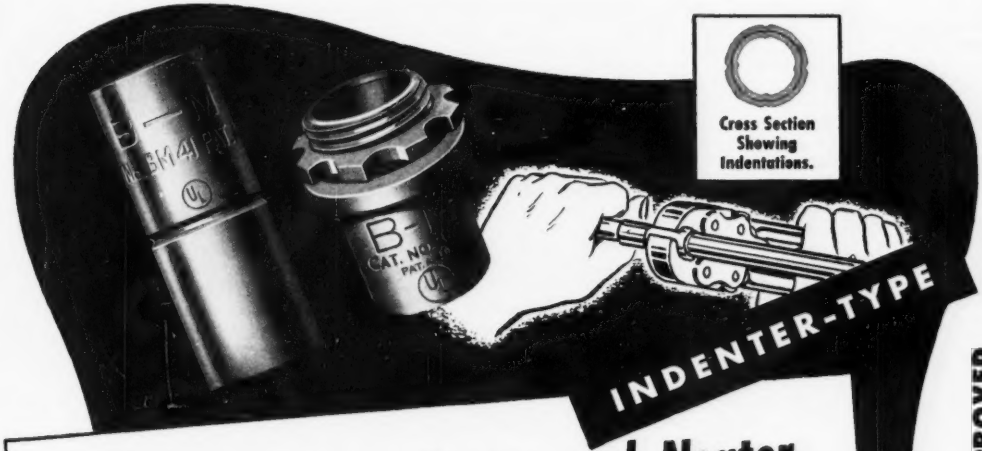
● BERT T. HEINZ, manufacturers agent, Seattle, has merged his interests with those of Don Wheat's manufacturers agency known as W. W. Wheat & Son. The new firm will be known as W. W. Wheat & Associates. Heinz will cover the territory of Washington, northern Idaho and Montana. Pete Ellis of Portland has been appointed to cover Oregon and southern Idaho. Firm headquarters will be at 560 First Ave. S., Seattle.

● C. T. BAKEMAN & ASSOCIATES, representatives for F. W. Wakefield Brass Co., Silvray Lighting Co. and the Kirlin Co., announce new offices at 752 Natoma St., San Francisco 3. Ted Bakeman has associated with him Frank E. Duhme Jr.

● WEST COAST sales representatives attending the recent sales conference of Simpson Electric Co. in Chicago were R. G. Bowen, Denver; C. R. Lynch and R. O. Lynch, Los Angeles; W. J. Purdy and W. J. Purdy Jr., San Francisco.

● GREGORY ELECTRIC CO., manufacturers of electric transformers, is moving from Chicago to San Diego. Joseph Pass, president of the firm, announced that key men from his Chicago plant will be brought to San Diego.

● NEW SALT LAKE CITY headquarters of Westinghouse Electric Corp. are located at 235 S. Temple St., including offices, warehouse and shop repair facilities.



Install E. M. T. Faster and Neater with BRIEGEL Thin-Wall Fittings

NEATER • FASTER • STRONGER • APPROVED

All B-M Fittings Carry the Underwriters' Seal of Approval

FOR faster, neater and stronger thin wall conduit connections insist on either Briegel Indenter or Twiston Briegel Self-threading type all steel, one piece connectors and couplings.

B-M Indenter fittings, the only approved couplings and connectors of this type, have long enjoyed wider use and application than any other method of installing E.M.T.

The new B-M Twiston Self-threading fittings now make it possible to have threaded, raintight E.M.T. connections without the use of dies. Two complete turns with a pair of pliers threads the tubing and screws the fittings into a locked position, which results in the strongest connection possible and one that will withstand severe vibration.

Whatever the thin wall job might be, you will find that you can do it neater, faster and better with Briegel UL Approved E.M.T. fittings.

BRIEGEL METHOD TOOL CO.

GALVA, ILLINOIS

DISTRIBUTED BY

The M. B. Austin Co., Northbrook, Ill. Clifton Conduit Co., Jersey City, N.J. The Steelduct Co., Youngstown, Ohio Nat. Enameling & Mfg. Co., Pittsburgh Clayton Mark & Co., Evanston, Ill. Gen. Electric Co., Bridgeport, Conn. Enameled Metals, Pittsburgh, Penn. Kondu Mfg. Co., Ltd., Preston, Ontario

● A "CARNIVAL OF MEASUREMENTS" is being exhibited in the West by General Electric Co.'s meter and instrument divisions. According to R. J. Hoffman, G-E meter specialist at San Francisco, 150 devices and components for measurement of electrical and non-electrical quantities will be shown. Eighteen display panels will cover different instruments or classes of instrument to give complete presentations. Many of the panels are working models, Hoffman said, and specialists will accompany the show to explain applications. In California, the display starts at Redding on Jan. 24, then goes to Sacramento, Stockton, San Francisco, Oakland, Palo Alto, San Jose and Fresno.

● GORDON E. WILKINS announces that he has relinquished all Ironrite factory activities, but will retain the distributorship of Ironrite in California, Utah and Arizona. Los Angeles headquarters will be maintained at 121 S. Alameda St., with a display room at 1163 Broadway, Oakland headquarters will be at 3100 Telegraph Ave. In addition there is a display room in the Western Merchandise Mart, San Francisco.

● JOHN N. BARKER of San Francisco has been appointed manager of the major home electrical equipment department at Montgomery Ward Co., Spokane. Barker previously owned a chain of electrical stores in San Francisco which he recently sold. Before owning his own business, Barker was district appliance manager for Westinghouse Supply Co., San Francisco.

● THE LEE ARTER CO., electrical appliance manufacturers' representatives, has moved its Los Angeles office to larger quarters at 672 S. Lafayette Park Place. At the same time Arter announced that three new members have been added to the company's sales staff. They are John Kelly who will cover Arizona; Dwight Stuart, Seattle; Oscar Shane, San Francisco.

● A. A. KUHNHAUSEN, branch manager, San Francisco, for Altorfer Bros. Co., has announced the appointment of Joseph C. Lee as district manager for the Sacramento, San Joaquin and western Nevada territories. Lee was formerly with the Maytag Co., San Francisco.

● HAL A. GARDNER has been appointed sales manager of the manufacturing division, Columbia Electric Mfg. Co., Spokane. He will headquarter in Seattle. Gardner was formerly with Pittsburgh Reflector Co., and more recently served as engineer for Frederick & Nelson, Seattle.

● WILLIAM P. HARRISON has been appointed to head a new sales division of Sues, Young & Brown, Los Angeles distributors. Harrison will be responsible for the distribution of Speed Queen washers and ironers, Hamilton clothes dryers, Thermador ranges, and Tornadofans. Edward Dymek will be manager of the Coolerator division and will specialize in home refrigerator and freezer sales.

● WESTINGHOUSE ELECTRIC Corp. has announced plans to purchase the 57-acre Sunnyvale, Calif., Works which was leased sometime ago from the Joshua Hendy Iron Works. Westinghouse assumed operation of the plant as of March 1, 1947 under terms of a ten-year lease with the option to purchase by Nov. 1, 1948.

● BEN G. SANDERSON, Western regional sales manager of Deepfreeze, San Francisco, has announced the appointment of John G. Watts as district sales manager, Los Angeles. Watts was formerly with McCormick & Co., San Francisco, and before that with Electromaster in Detroit.

● A. R. JOHNSON Co., with headquarters at 510 S. Arroyo Parkway, Pasadena, has taken over distribution of Quality ranges, steel kitchen cabinets and cabinet sinks in the state of California. F. S. Lodge will serve as representative for the organization in northern California with display space at the Western Merchandise Mart, San Francisco.

● L. G. WENDEGATZ has become a partner of A. A. Marrs in the newly formed Marrs & Wendegatz Co., and is representing the Pacific Electric Mfg. Co. of San Francisco in the Kansas City area. Marrs has been with Pacific Electric Mfg. Co. for 21 years.

● PAUL BRYANT, formerly with Los Angeles RCA-Victor distributors, has resigned that position to become associated with George Dyna as representatives of Bendix radio and television in the southern California area.

● CALIFORNIA Electrical Construction Co. and California Electric Service Inc., celebrate the centennial of gold discovery by publishing a fascinating booklet recounting the history of that pioneer electric company. It tells of the gold rush, the coming of the railroad to California, and with it the cross-country telegraph. In December 1870 three of the men from the Western Union Telegraph Co. organized the Electrical Construction and Maintenance Co., making and installing telegraph and annunciator systems, later spark gas lighting sets, burglar alarms. In June 1877 the name was changed to California Electric Works. The booklet recounts interesting history of street-lighting installation, wiring for famous buildings and homes, telephone installations; its purchase later in 1902 by Western Electric Co. when it was operated in conjunction with the supply business that later became Graybar; its sale back to Russell Wolden who later established a supply department that became California Electric Supply Co. Clyde Chamblin and T. H. McDonnell bought the company in 1913. In 1917 Chamblin acquired full ownership, and today the company is owned by him and his two sons, Garth and Keith.

● Joseph V. Smith, president, and James H. Knowles, assistant to the president, accompanied by W. W. Glosser, Pacific Coast vice-president of Hubbard & Co., covered the Hubbard properties and visited its sales representatives on the Pacific Coast recently. Norman V. Arntzen, Los Angeles manager, entertained the group and company customers at a dinner in Los Angeles.

● ELECTRIC SALES & SERVICE Ltd., Honolulu, has announced that it will move into new quarters at 1681 Kapiolani Blvd. The building will contain three ground floor stores of 1,000 sq. ft. each, in addition to the one to be occupied by Electric Sales and Service.

● PAUL PALMER, formerly of the Los Angeles office of Electrical Specialty Co., took over Dec. 1, as Portland branch manager for the company. He replaces Howard Perkins.

● GRAYBAR ELECTRIC Co. will construct a new $750,000 office and warehouse in San Francisco. The building will have three stories and 60,000 sq. ft. of floor space.

● TRI-STATE SUPPLY CORP., Los Angeles, has announced that it will distribute a new line of insulating varnishes, enamels and sealers under its own brand name of Tri-Var.

● A FIRE of undetermined origin at the Los Angeles plant of H. C. Frisbie Co., manufacturers of lighting fixtures, caused damage estimated at $250,000.

● WESTINGHOUSE ELECTRIC SUPPLY Co., Salt Lake City, has moved into new quarters at 210 Rio Grande Ave.

● F. B. CONNELLY Co., Portland distributors of major appliances, has moved into larger quarters at 905 N. W. 12th Ave.

when you don't need indication
THIS IS THE CUTOUT TO USE—

It saves you money!

This G-E non-indicating fuse cutout is the lowest in price of all wet-process-porcelain enclosed types. It costs less to maintain—with practically no moving parts. It is the sturdiest cutout built. You can stock fewer replacements—all contacts, fuse holders and other parts have been interchangeable for 21 years.

Backed up by an unexcelled operating record of performance efficiency, and durability, this cutout is the most reliable and economical type you can buy.

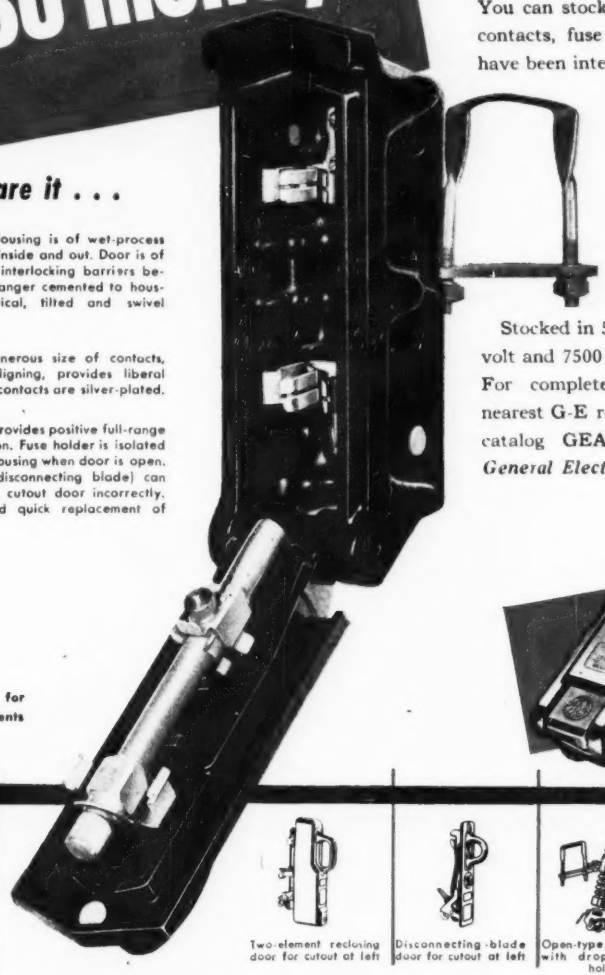
Stocked in 50- and 100-ampere, 5000-volt and 7500/12,500-volt Gr. Y ratings. For complete information, see your nearest G-E representative or write for catalog GEA-2390. ***Apparatus Dept., General Electric, Schenectady 5, N. Y.***

Compare it . . .

MECHANICALLY—Housing is of wet-process porcelain glazed inside and out. Door is of Textolite. Double interlocking barriers between contacts. Hanger cemented to housing permits vertical, tilted and swivel positioning.

ELECTRICALLY—Generous size of contacts, which are self-aligning, provides liberal contact area. All contacts are silver-plated.

FUNCTIONALLY—Provides positive full-range current interruption. Fuse holder is isolated from contacts in housing when door is open. Fuse holder (or disconnecting blade) can not be placed in cutout door incorrectly. Enables easy and quick replacement of blown fuse.



Primary Fuse Cutouts for All Service Requirements

Enclosed indicating and drop-out fuse cutout

Two-element reclosing door for cutout at left

Disconnecting-blade door for cutout at left

Open-type fuse cutout with drop-out fuse holder

Flip-open fuse cutout

GENERAL ELECTRIC

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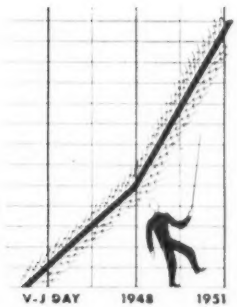
PROFILES

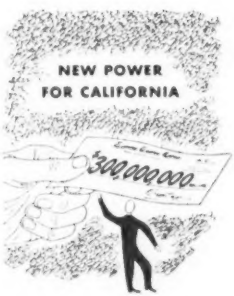
Above, left, E. S. Holt, appointed manager of the Emeryville plant, manufacturing and repair division of Westinghouse Electric. Above, right, A. S. Moody, retired commercial vice-president of General Electric Co.'s Pacific Northwest district. Center, Charles P. Johnson, Western public relations manager for Westinghouse, awarded company's order of merit for service. One of the highlights of the G-E power sales conferences held in Berkeley and Los Angeles was a walking fish. Here he is, below, with O. R. Doerr, PG and E, and Allen Jones, G-E.

P. G. and E. adds 404,000 new electrical horsepower in 1948

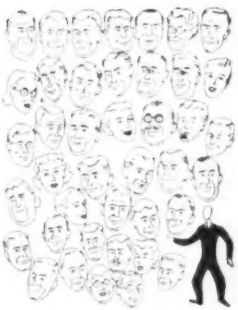
and 1½ million more on the way



Record power growth. P. G. and E. began building new power plants immediately after V-J Day. 404,000 new horsepower were installed this year. 1½ million more will be added in the next 3 years.



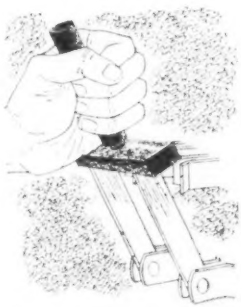
$300,000,000 already invested. Most of the money for expansion comes from invested savings of thousands of people—many of them your friends and neighbors. They are the real P.G. and E. builders.



148,000 stockholders, mostly Californians, have put their savings in P.G. and E., becoming partners in one great enterprise. Few companies in the entire nation are more widely owned.

More than 7,000 jobs have been created by the expansion. This additional payroll has materially helped all sorts of business throughout the area we serve.

Still more generating plants, both steam and hydro, are being built to meet the growing demand. In 1948 alone nearly 70,000 new customers were connected to our lines!



It all adds up to the biggest power-building program in America today... going full speed ahead for the factories, farms and homes of Northern and Central California.

Work never stops on our power-building program

P·G·and E·

PACIFIC GAS AND ELECTRIC COMPANY

EW 101-149

there's a "Welcome" out

for sales at the home

with Adequate Wiring!

There's an easier row for dealers to hoe, where adequate wiring has broken the ground. For one thing, it assures efficient electrical service — and users satisfied with today's appliances are more likely prospects for tomorrow's. For another, sales talks flow smoothly up through the "closing" point when installation presents no obstacles — and with circuits, outlets and switches already in place, one "sales-resistance" has been eliminated. The promotion of adequate wiring is an important part of your business. Don't overlook it!

PACIFIC COAST ELECTRICAL ASSOCIATION

601 WEST FIFTH STREET, LOS ANGELES 13, CALIFORNIA • 447 SUTTER STREET, SAN FRANCISCO 8, CALIFORNIA